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AN ANALYSIS

OF

POISONS,

INCLUDING

THE SYMPTOMS, TREATMENT, MORBID
APPEARANCES, AND TESTS;

WITH

DECOMPOSITIONS.

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PREFACE.

There is one great error which authors generally commit, their writings are not sufficiently elementary for the student, but are better adapted for those far advanced in professional knowledge; for that part of chemistry which relates to the mineral kingdom, it is especially the case. The metals in a pure and uncombined state are described, and easily recognized when seen; but in an impure and [illegible]combined state, the student meets with the greatest difficulty, for although he may be successful in obtaining a few tests after perusing several works, and on applying them, witness the important changes taking place, as fluids becoming solids, solids becoming fluids, and the mixture of liquors producing all the colors of the rainbow; yet he may not understand the nature of these changes, or the composition of the new formed substances.

I have described the nature and quality of the most important substances that require special investigation, and have given their action on the animal economy, the symptoms they induce in poisonous doses, the antidotal treatment, morbid appearances, and the tests, with the *rationale* of the changes which occur during the action of the reagents, with their equivalent, or combining numbers.

ANALYSIS OF POISONS.

&c. &c. &c.

CHAPTER I.

PRELIMINARY REMARKS.

When the practitioner is called to attend a person labouring under the suspicion of being poisoned, the greatest caution on his part is required.

In the first place, no time should be lost in applying suitable remedies to the apparent symptoms of the patient, and in this he will be assisted by the presence of a wine glass, phial, or paper, containing some remains of a liquid or powder.

In the next place, he must inquire whether the symptoms came on shortly after eating, and if so, what food the patient had recently partaken, and in what vessel it was cooked; he ought at the same time to obtain possession of all that remains, so that, in case of a medico-legal inquiry, he may be able to analyse it.

In the third place, he must have all the matter (brought away, either by vomit or stool) carefully preserved, as in cases where poison has been administered, the best indication of its presence will be thus ascertained, especially in the vomited matter. If the body of a person has been found, and he is called in to examine it, he must first proceed to the place from whence it came, carefully noting whether there are any appearances of foot marks, or any indication of resistence, or whether, in consequence of the peculiar situation of the place, death might have occurred accidentally, as entering a well, cave, cellar, brew-house, sewer, &c., where noxious gases are likely to be generated. If the body was found in bed, he must then observe whether there was good ventilation; if a charcoal fire had been burning, or if the room had contained many flowers, as serious consequences have occurred, from persons incautiously sleeping in a confined room, containing a large quantity of May-flowers, &c.; he must likewise keep a watchful eye over the actions of persons surrounding him. Occasionally by some action or expression he may obtain a clue which will assist in guiding him through the mysterious labyrinth in which he is involved. It is here that the experienced practitioner has a great advantage, because he obtains all the necessary information without exciting the suspicion of those around him, that he is narrowly watching their actions.

Before he inspects the body, he must see whether the clothes are stained, muddy, or torn, as if the individual had struggled to get away. In examining the body he must be careful to observe if there are any marks on the skin, such as punctures, bruises, stains, &c., and if any are present, to discriminate whether they are recent; if so, whether they are the effects of ecchymosis, or extravasated blood, into the cellular tissue; or merely the gravitation of blood to that part of the body which is undermost; or if they result from the action of some irritant or corrosive substance having been applied. If there is any sanguineous discharge from any of the natural outlets of the body, such as the ears, nose, eyes, &c.; he must examine these parts minutely, to see if any instrument had passed through either of these organs into the brain or viscera, thereby causing death: having satisfied himself on these points, he may next proceed to examine the internal parts.

INSPECTION OF THE INTERNAL PARTS OF THE BODY.

By the previous examinations, which the practitioner has made, he will generally be able to determine in which cavity of the body the cause of death has originated, and accordingly he will proceed to examine it; but if no external appearances exist, whereby he may infer in which particular viscus it is to be looked for, then he must commence the examination of the four cavities; they are *Cranial*, *Thoracic*, *Abdominal*, and *Pelvic*.

CRANIAL CAVITY.

This cavity contains the brain and its membranes. To open it, an incision must be made, commencing just above the cartilage of one ear, carrying it across the head to that on the opposite side; dissect back the scalp—the anterior flap must be drawn over the eyes, the posterior over the occipital protuberance. Next, with a fine saw, cut very carefully through the different bones of the skull, commencing at the depression of the frontal bone above the eye-brows, through the temporal above the ear, and through the occipital protuberance; then do the same to the other side; he must be careful to cut through the bone, and yet not to injure the subjacent dura mater; with an elevator now raise the bone carefully, and when removed, numerous little bloody spots will be seen on the membrane beneath; this is owing to the rupture of small blood vessels, passing from it into the substance of the bone. Next, examine if the removed bone is fractured, or has any protuberances on it, which by pressing on the brain might be the cause of death; make a circular incision of the membranes of the brain, and remove them, observing at the same time if any sanguineous or serous fluids escape from underneath (which should also be noticed in sawing through the bones of the head, as effusion of serum, external to the dura mater, is a frequent result of inflammation of the membranes); being removed, they must be next examined, to see if any tumours are attached to them, or if they are preternaturally thickened. The external surface of the brain must also be examined, if the vessels are turgid, or any of them ruptured, or if there is any extravasation of blood upon its surface.

Inspection of the substance of the brain.—Cut the two hemispheres of the brain off a little above the corpus callosum; examine these to see if there is any ramolissement, abscess, or extravasated clot, if the vessels are much gorged; next open the ventricles, noting their contents, such as the quantity and consistence of the fluids, &c.; then examine carefully the base of the brain, observing if there is any thing unusual either in its appearance or texture.

The cerebellum is to be examined in the same manner. When the brain is removed, we must inspect the base of the skull, and observe if there are any extraneous bodies, such as tumours, thickning of the parietes, &c., or if the skull is fractured.

THORACIC CAVITY.

This cavity contains the heart, lungs, large blood vessels, and œsophagus. Great care is requisite in investigating these parts, not to injure any of the large vessels, so as to cause extravasation, which would frustrate the examination. To obtain a view of this cavity, an incision must be carried from the clavicular end of the sternum to the symphysis of the pubes, dividing the integuments, muscles, and peritonæum; next, make a transverse incision three inches along each clavicle; dissect back the integuments of the sternum and ribs, then with a fine saw cut the shafts of the ribs through, within three inches of their attachment to the cartilage; in sawing through them, great care is requisite not to injure the parts situated beneath. When the bones are well separated, pass the hand underneath the sternum so as quietly to detatch any adhesions of the pleura, then reflect the whole towards the face. The pleura, covering the lungs and heart, being exposed to view, they must be opened. In the pericardium a small quantity of fluid is generally found, which allows the approximate surfaces of the membrane to move easily, but sometimes there is an accumulation of several ounces; it is then in a diseased or morbid state, and may cause death by impeding the heart's action—it is generally the effect of chronic inflammation. In the pleura, lining the lungs, also a small quantity of fluid is usually found, which lubricates the sides and allows them to play freely; but as in the pericardium so in the pleura the quantity of fluid may be so large as not to allow the lungs their power of dilatation, and death may result from suffocation; the cavities may also contain besides serum, blood and pus; the extravasation of the first may be caused by some external injury, or rupture of a large blood vessel, as occasionally happens in fractured ribs, aneurism, phthisis, &c.; the production of the latter may be caused by the irritation produced by some foreign body, as a spicula of bone from a fractured rib, or the bursting of an abscess from the lungs or liver; sometimes there is a communication between the lungs and pleura, and a large quantity of pus may be accumulated in the latter, when hæmotysis supervenes; the patient in this case is generally carried off; and, on examination, the effused blood will be found mixed with the pus in the pleura.

Lungs.—The lungs and bronchi should be next examined. Death may ensue from the insertion of a foreign substance into the windpipe, or from hæmoptysis, or compression of the lungs by an opening made through the integuments and pleura, allowing the air to rush in, or by pulmonary, apoplexy, &c. The proximate cause of these morbid appearances is easily detected by the operator.

Heart.—The heart may present some one of these morbid appearances to which the death of the individual may be attributed. It may have its parieties hypertrophied or enlarged, with dilatation of the cavity, or hypertrophy, with lessening of the cavity, or the valves may be hypertrophied without alteration of the walls or cavity. There may be atrophy or softening of the texture of the heart, inducing aneurism, or there may be some malformation. The œsophagus may be examined with the stomach. Having examined the thoracic viscera, and no morbid appearance presenting itself, whereby we may discover the proximate cause of disease, we proceed to examine the

ABDOMINAL CAVITY.

This cavity contains the liver, stomach, intestines, spleen, pancreas, kidneys, and peritonæum.

Liver.—The morbid appearances with which the liver is liable to be affected, and which generally terminate in a sudden death, are the following:—abscess of the liver, bursting either into the pleura or peritonæum, rupture of the liver from a violent blow, rupture of a blood vessel in the liver. (Vide *Mayo Path.* p. 390.)

Stomach.—The only two morbid states of the stomach in which sudden death takes place, is perforation of its coats, with an escape of the contents into the peritonæum, and active hæmatemesis. Before the operator proceeds to examine the contents of this viscus, he must pass two ligatures round its cardiac orifice, about half an inch apart, and two round its pyloric; he may then pass his knife between each of the two ligatures, and remove the stomach: this ought next to be examined, and its contents carefully placed in some vessel on one side; if there are any peculiar appearances on its inside (such as redness or marks of inflammation, or if the mucous membrane is abraded in any part, or discoloured; also if there is any preternatural softening or perforation of its texture, or great turgescency of the vessels), they may be noted down; the œsophagus being removed, should be submitted to the same examination as the stomach; when this is finished, they should undergo the operation of testing.

Intestines.—The intestines are to be submitted to the same treatment as the stomach and œsophagus.

Spleen.—A violent blow on the region of the spleen, inducing laceration and an effusion of blood, may cause death, by its becoming lacerated, and an effusion of blood taking place.

Pancreas.—Sudden death, I believe, has not occurred from any morbid state of the pancreas.

Peritonæum.—The peritonæum may be next examined, to ascertain if there are any marks of inflammation, or serous effusion, &c.

Kidneys.—On examining the kidneys, any unusual or unhealthy appearance may be noted down, as several species of calculus, abscesses, hydatides, &c. are frequently observed.

PELVIC CAVITY.

In this cavity are contained the urinary and reproductive organs, as also the rectum. Several cases are on record of persons having had poison applied to these parts, for the purpose of destroying life, and therefore they require a very careful examination. The parts require to be taken out, and the appearance of the different surfaces must be noted down; they are then to be cut into small shreds, and boiled in distilled water, and filtered; the residual matter is to be submitted to a similar process, so that if there are any remains of poison attached to these parts, it may be dissolved, and held in solution; this is next to be treated with its proper re-agents.

EQUIVALENT NUMBERS.

By equivalent number we mean the definite proportion by weight, in which all bodies combine, one being taken as a standard of comparison: as hydrogen is supposed to be the lightest ponderable body in nature, so it is placed at the commencement of the scale; the combining proportion of carbon is six; oxygen eight; thus water is formed of eight parts of oxygen by weight, and one of hydrogen; therefore, nine, the resulting number, is the exact proportion in which it combines with other bodies. But many bodies have the property of combining in several proportions, that is, in some multiple of the first.

Oxygen for instance, unites, with nitrogen in five proportions, each being a multiple of the first.

14 Nitrogen+ 8 or 1 Eqt. of Oxygen=22 or 1 Eqt. of Protox. of Nitro.
14 Nitrogen+16 or 2 Eqt. of Oxygen=30 or 1 Eqt. of Deutox. of ditto.
14 Nitrogen+24 or 3 Eqt. of Oxygen=38 or 1 Eqt of Hyponitrous acid
14 Nitrogen+32 or 4 Eqt. of Oxygen=46 or 1 Eqt. of Nitrous acid.
14 Nitrogen+40 or 5 Eqt. of Oxygen=54 or 1 Eqt. of Nitric acid.

Chlorine, the equivalent number of which is thirty-six, unites with Mercury in two proportions.

200 or 1 Eqt. of Merc.+36 or 1 Eqt. of Chlor.=236 or 1 Eqt. of Calomile.
200 or 2 Eqt. of ditto+72 or 2 Eqt. of ditto=272 or 1 Eqt. of Cor. Sub.

We would advise every one to study diligently the equivalent numbers, as they materially assist in the elucidating of the numerous and complicated changes, which occur in practical chemistry.

CHEMICAL EQUIVALENTS.

This list of the Chemical Equivalents of the simple elementary bodies is taken from Turner's *Chemistry*.

Aluminum	13.7
Antimony	64.6
Arsenic	37.7
Barium	68.7
Boron	10.9
Bismuth	71.
Bromine	78.4
Cadmium	55.8
Calcium	20.5
Carbon	6.12
Cerium	46.
Chlorine	35.42
Chromium	28.
Cobalt	29.5
Copper	31.6
Fluorine	18.68
Glucinum	17.7
Gold	199.2
Hydrogen	1.
Iodine	126.3
Iridium	98.8
Iron	28.
Lead	103.6
Lithium	10.
Magnesium	12.7
Manganese	27.7
Mercury	202.
Molybdenum	47.96
Nickel	29.5
Nitrogen	14.15
Osmium	99.7
Oxygen	8.
Palladium	53.3
Phosphorus	15.7
Platinum	98.8
Potassium	39.15
Rhodium	52.2
Selenium	39.6
Silicium	7.5
Silver	10.8
Sodium	23.3
Strontium	43.8
Sulphur	16.1
Tellurium	32.3
Thorium	59.6
Tin	58.9
Titanium	24.3
Tungsten	94.8
Vanadium	68.6
Uranium	217.
Yttrium	32.2
Zinc	32.3
Zirconium	33.7

The discrepancy between the equivalent numbers in this table, and those contained in the following pages, is owing to the latitude given to the student (for the sake of making the study of these numbers less difficult), of converting the equivalents terminating in fractions, into whole numbers; that is, to take the nearest round figure to which they approximate : for example, potassium is 39.15, for common experiments it may be set down as 40 ; chlorine is properly 35.42, its equivalent number is called 36 ; carbon is 6.12, the number may be stated to be 6, &c. But on those occasions where the calculations are required to be very exact, the numbers set down in this table must be used.

SINGLE AND DOUBLE ELECTIVE AFFINITY.

The peculiar property which some bodies possess, of uniting with one of the elements of binary compounds to the displacement of the other, is termed single elective affinity ; for these changes it is necessary that the substance employed should be held in solution, and that the new compound be insoluble ; but the term is best explained by an example. If sulphuric acid is added to a solution of acetate of lead, the oxide directly quits the acetic acid (which remains in solution), and uniting with the sulphuric acid, is precipitated as a white sulphate ; the oxide of lead here seems to have a greater attraction or affinity for the sulphuric acid, and therefore unites with it, in preference to the acetic acid.

When one binary compound is added to another, and a mutual decomposition ensues, so that two new compounds are formed, the action that regulates these changes is termed *double elective affinity*.

Example :—If sulphate of copper is added to carbonate of potash, a mutual change of principles takes place ; an insoluble carbonate of copper is thrown down, and sulphate of potash remains in solution. In this case the oxide of copper has a greater affinity for the carbonic acid than the potash, and the potash has a greater affinity for the sulphuric acid than the copper ; therefore these two new compounds are the result.

TESTING FOR POISONS.

Poisons may require to be tested, either in their uncombined state (as when some remains are found in a wine glass, paper, phial, or undissolved in the excreted matters), or in a state of mixture, (as when dissolved and mixed in the fluids of the stomach, or in articles of diet).

In an uncombined state.—If the suspected poison is liquid, the practitioner must first test whether it is acid, alkaline, or neutral; to perform this, he must use a piece of litmus and turmeric paper. If the litmus is turned red, the solution is acid; if the turmeric paper is stained brown, the dissolved substance is alkaline; if the colour of either slip of paper be not changed, then the solution is neutral.

This is very essential in preparatory testing, as it saves considerable time and labour; for the practitioner may be searching for the oxide of a metal, and may proceed to test for each one individually till he has run through the entire catalogue, when, after the lapse of considerable time and labour, to his astonishment, he finds an acid has been taken. When he has finished this preparatory testing, and has discovered to which of the three classes the substance under consideration belongs, he may refer to the following list:—

ACIDS.

Acetic is known by the peculiar ordour of its vapour; with nitrate of silver, a black precipitate falls.

Muriatic and Nitric—When mixed together, they dissolve gold.

Sulphuric—Added to a soluble salt of baryta, a white precipitate falls.

Prussic—Known by its almond-like odour.

Oxalic—With lime, an insoluble oxalate is formed.

ALKALIES.

Ammonia—Its peculiar vapour is given off by the application of heat.

Potash—Precipitated by tartaric acid.

Soda—Not precipitated by tartaric acid.

Baryta forms an insoluble precipitate with sulphuric acid.

Lime—Oxalic acid thrown down, an insoluble oxalate of lime.

NEUTRAL SALTS.

Salts not precipitated by hydrosulphuret of ammonia, nor by carbonate of potash.

They are the salts of ammonia, potash, soda, &c.

Salts not precipitated by hydrosulphuret of ammonia, but by carbonate of potash, they are the salts of paryta, lime, &c.

Salts precipitated by hydrosulphuret of ammonia and sulphuretted hydrogen. They are

	Hydrosulphuret.	Sulphuretted Hydrog.
Antimony	Orange	Orange,
Bismuth	Blackish brown	Blackish brown,
Copper	Black	Black,
Gold	Yellow	Yellow,
Lead	Black	Black,
Mercury	Brownish black	Black,
Silver	Black	Black,
Tin	Protoxide black, Peroxide yellow,	Brown,
Zinc	White	Yellowish white.

These tables may give some slight clue as to the nature of the substance taken. (For more copious remarks, see the description of the poison.)

If the substance is in the solid state, it must be dissolved in distilled water, and the previous general analysis must be adopted.

IN A STATE OF MIXTURE.

When the contents of the stomach, or any membrane supposed to have had poison applied to it, is to be examined, the membrane must be cut into small pieces, and placed in a vessel with the contents of the stomach; pure distilled water must be added, and the solution filtered; the residual matter on the filter must be rubbed down in a mortar, and fresh distilled water applied to it, and again filtered. This is to be repeated several times; the filtered liquid is to be evaporated to a proper consistence, and then tested with the above re-agents. Each substance likely to be used for the purpose of destroying life, will be treated more fully elsewhere, together with its appropriate re-agents, &c.

CHAPTER II.

Poisons are generally classed according to their action on the tissues; they are divided into three great divisions: the corrosive, or irritants, narcotics, and narcoto-acrids.

CORROSIVE, OR IRRITANT, POISONS.

Corrosive, or irritant, poisons are known by the properties they possess, of destroying and corroding, the tissues brought in contact.

Externally, they destroy the cuticle, producing swelling, redness, heat, and pain, followed by ulceration and sloughing of the parts.

Internally, there is a pricking or burning sensation in the tongue, which is swollen and red, often covered with white vessicles; the mucous membrane, lining the mouth and fauces, is very vascular, dry, and often ulcerated; there is a sense of constriction about the œsophagus, and great difficulty of swallowing. The stomach invariably suffers; there is heat, with sharp lancinating pains, in the right and left hypochondriac and epigastric regions, extending down the abdomen, with great tenderness on pressure, attended with sickness and vomiting; the contents of the stomach being first brought up, followed by mucus and bile, frequently mixed with blood; griping pain following the course of the bowels, marking inflammation; copious evacuations downwards, the matter often mixed with mucus and blood; tenesmus is occasionally present; there is difficulty of breathing, with great disturbance of the circulation; pulse variable, often quick and feeble; great prostration of strength, cold, and clammy moisture of the skin, syncope, convulsions, death.

Most of these symptoms are present in every case, but occasionally they may be slightly modified by the virulence and quantity of poison taken, or the peculiar idiosyncrisy of the patient.

TREATMENT.

On being called to a patient labouring under these symptoms, you may safely conclude that some poison of a corrosive or irritant description has been taken (occasionally you have some clue by the presence of a bottle, wine glass, or paper, containing some portion of the poison); in such a case, the antidote and treatment will be found under the description of that poison; but if you are still uncertain, then empty the stomach of its contents as soon as possible, by means of the stomach pump, provided the symptoms have continued only a short period. But if much time has elapsed since the corrosive was taken, then softening and ulceration of the coats of the stomach is to be feared, and you will, in drawing off the contents of that viscus, catch some of the soft and loose portion of the ulcerated membrane, tearing it off, and producing most serious injury; the white of eggs, or albumen, is an excellent antidote, as by its glairing consistence it serves to protect those parts hitherto uninjured, and also it may involve any portion as yet undissolved.

After taking copious draughts of bland mucilaginous mixtures, an emetic should be given (Zinci Sulphas ʒss ad ℈ij), so as to make the patient vomit freely; then more albumen, followed by another emetic; this should be continued until you are fully convinced the whole of the contents of the stomach are brought up. If, after having taken the mucilaginous mixture, the patient vomits freely, the emetic should be dispensed with,as by its stimulating properties it is liable to render the subsequent inflammation more acute.

TREATMENT FOR THE ACIDS.

If one of the mineral acids has been taken (which is easily known by the strong acid action which the vomited matter possesses, and by the lips and mucous membrane of the mouth, &c. being stained yellow or black), then an alkaline should be given, as magnesia, chalk, soap and water, an aperient or inert compound being formed by their union.

TREATMENT FOR THE ALKALIES.

Alkalies, like the acids, destroy the mucous membrane whenever they come in contact, and the vomitted matter induces a strong alkaline action. In this case some fixed oil should be given, as the *oleum olivæ*, which, by combining with the alkali, forms an inert saponaceous compound.

MORBID APPEARANCES.

The morbid appearances of the different parts vary according to the degree of chemical energy exerted upon them, but the general appearances are these. The mucous membrane of the mouth, fauces, œsophagus, is very vascular or ulcerated; the gullet is at times constricted or denuded of its membrane.

On opening the stomach, broad patches of inflammation are occasionally seen, with softening or hardening of the coats, the mucous membrane being easily separated from the muscular; with occasional perforations, puckerings, or extravasation of blood between the coats, and even into the stomach; the whole or greater part of the alimentary canal is marked by the characteristic appearances of inflammation, together with ulceration, gangrene, or sphacelus.

DIVISION OF IRRITANT POISONS.

Irritant poisons are divided into the Corrosive, Astringents, and Acrids.

Corrosive, divided into
Acids Mineral,
Alkalies,
Antimony, and preparations,
Arsenic,
Baryta, Carb. and Muri.
Bismuth. ox. or Pearl white,
Copper, and preparations,
Enamel and glass powder,
Gold Muriate,

Calcium or Lime,
Mercury, and preparations,
Silver Nitrate,
Tin Muriate,
Zinc Sulphate,

Astringent.

Lead, and its preparations,

Acrids.

1 Gaseous, Chlorine, Muriatic Acid, Nitrous Gas, Nitro Muriatic vapours,
Vegetable,
Anemone Pulsatilla,
Arum Maculatum,
Œnanthe Crocata,
Clematis,
Colchicum Bulb,
Colocynth,
Convolvulus Arvensis,
Convolvulus Scammonii,
Daphne Mezereum,
Delphinium Stavisacre,
Elaterium,
Euphorbia Officinalis,
Gamboge,
Hellebore, black,
——— white,
Iatropha-manihot,
Oil Castor,
Oil Croton,
Ranunculus,
Rhododendron Chrysanthemum,
Rhus Toxicodendron,
Ricinus Indian,
Wolf's Bane.

MINERAL ACIDS.

Under the denomination of mineral acids we mean the muriatic, nitric, and sulphuric, although there are others, but they are so very unimportant, that a description would be superfluous.

The actions of the mineral acids are very similar; therefore, in describing one, the same remarks will apply to others; there are excruciating pain and heat at the stomach, great tenderness at the epigastric region, and frequent belchings and great fœtor of the breath, vomiting; the matter being brown or dark coloured, and effervesces; if with carbonate of lime, and reddens litmus paper, it is frequently mixed with little white shreds, or filaments, being the coagulated mucus; the lips are shrivelled, cracked, with sordæ, and stained brown or black, if sulphuric acid has been taken; if nitric, yellow. The mouth partakes very much of the same appearance; there is great difficulty in attempting to swallow, and sometimes total impossibility; the bowels are obstinately confined, accompanied with tenesmus and dysurira, a very weak and feeble pulse, cold and clammy moisture on the skin; dyspnœa, with much pain and suffocating sensation, owing to the inflamed state of the thoracic viscera; and death may take place from the second or third hour after taking it, to the twentieth day.

TREATMENT.

Attending a patient who has taken a mineral acid, we cannot be too active in endeavouring to neutralize the poison, fearing a sloughing of the mucus membrane; the best antidotes are the alkalies. Prepared chalk, whiting, or magnesia, or if they are not at hand, then the plaster of the walls, pounded and mixed in some bland fluid, and copious draughts given; they neutralize the acids, forming either inert or aperient compounds; milk and oleaginous liquids should be freely given; if these things are not very accessible, then soap and water may be prescribed, followed by demulcent liquids, as they render the vomiting more easy. The stomach pump, in these cases, is dangerous, and decidedly improper; for in sucking up the contents of the stomach, some loose filaments of the ulcerated coat may be drawn into the pipe, and you then add the danger of laceration to a case almost hopeless. Certain of having neutralised all the poison, the next treatment is purely medical,to subdue the great inflammation by bleeding, leeches, &c.

MORBID APPEARANCES.

There is more or less disorganization of the parts lining the mouth and pharynx, adventitious membranes are occasionally found lining the œsophagus, or it is so contracted by the cicatrization of the ulcerated parts, that it proves fatal. There is a very interesting account by Mr. Mayo, in his *Physiology*, p. 282, of a woman poisoned by sulphuric acid; she fell a victim to constriction of the gullet in forty-five weeks and three days; having vomited up the mucous membrane of the œsophagus seven days after the poison had been taken. There is occasional softening of the stomach, with perforation, great turgescency, and blackness of the lining membrane, which is not always corroded, the pyloric end generally contracted. The duodenum presents the same appearances as the stomach; there is often effusion of lymph on the pleura, marking the results of inflammation.

TESTS FOR THE ACIDS.

All acids turn vegetable blues red; this distinguishes them as a class. I shall now proceed to test those which come under the denomination of corrosive.

MURIATIC ACID, 37.

Chlorine 1 Eqt.	36	37 Eqt. Number.
Hydrogen 1 Eqt.	1	

It ought, when pure, to be colourless, but that which is generally met with in the shops has a yellowish green hue, owing to its containing some iron and free chlorine gas; it has a sharp acid taste, and suffocating pungent odour; on heating it, and allowing its vapour to come in contact with atmospheric air, dense white fumes are formed, owing to its great attraction for water, which can take up as much as 480 times its volume.

1st. Test.—On adding nitrate of silver to muriatic acid, a mutual decomposition takes place, the oxygen from the oxide of silver, uniting with the hydrogen of the muriatic acid, forms water; the chlorine,at the moment of its liberation,unites with the silver, forming a chloride of that metal, which is precipitated as a white flocculent powder, and the nitric acid remains in solution; on exposing the chloride to the rays of the sun or day-light it becomes of a brownish or black colour.

2nd.—If nitro muriatic acid is added to leaf gold, it is directly dissolved, with extrication of nitrous acid fumes.

Rationale.—Gold leaf is not affected by muriatic, or by nitric acid separately; the nitric acid sets the chlorine of the muriatic acid at liberty, which then unites with the gold; forming a soluble chloride of gold, the hydrogen of the muriatic, uniting with one equivalent of oxygen from the nitric acid, forms one equivalent of water, and the nitrous fumes are evolved.

3rd.—When muriatic acid gas comes in contact with ammonia, dense white fumes are formed; the acid unites with the ammonia, forming muriate of ammonia, which is precipitated.

NITRIC ACID.

54 + 1 of Water = 63.

Oxyg. 5 Eqt.		40	63 or 1 Eqt of liq. nit. acid.
Nitro. 1 Eqt.		14	
Hydr. 1 Eqt.	8	1 Eqt. of Wat. 9	
Oxyg. 1 Eqt.	1		

Nitric acid cannot exist but in contact with water; in its pure state it is colourless, but it generally contains iron, sulphuric, nitrous, and muriatic acids; the latter impurity is owing to the adulteration of the nitrate of potash, from which the nitric acid is obtained, with muriate of soda, or common salt; another impurity arises from the acid used in its formation: when these acids are present, they may easily be detected by their proper test, as nitrate of baryta for the sulphuric, and nitrate of silver for the muriatic acid; the iron is easily detected by the addition of an infusion of galls, which becomes black if that metal is present. Heat drives off the red nitrous fumes.

Nitric acid is known by the peculiar odour of its vapour.

If it is added in a diluted state to copper, tin, silver, &c., it becomes decomposed; a portion of its oxygen going to the metal, forming an oxide which unites with some undecomposed acid, forming a nitrate of the oxide of the metal used; nitrous gas flies off in yellowish red fumes.

Morphia and brucia added to nitric acid, turn it to an orange red, which, by the continued action of the acid the solution acquires a yellow colour, and the morphia or brucia is ultimately converted into oxalic acid; this is the only acid that acts in this way; added to muriatic acid, it forms the aqua regia, which possesses the property of dissolving gold. (For its decomposition see muriatic acid.)

When in a compound mixed state, it may be decomposed or neutralized, but, according to several authors, even then it may be detected after some considerable time. Mr. Ollivier has detected it in various stains on the skin, a day after it had been applied. Dr. Christison has detected it seven weeks after, and I cannot pay a greater tribute of respect to this learned physician, than recording, in his own words, the method he pursued:—" Nitric acid produces in the skin a yellow stain, which gradually becomes of a dirty orange; and then, as the cuticle desquamates, of a dirty yellowish brown; but in all these states it is at once rendered for a time of a lively yellow tint; but by the action of ammonia, I am not aware that any other stain is similarly effected. Stains on clothes are generally yellowish, reddish yellow, and brownish yellow, and are attended with more or less disintegration of the texture of the cloth; the method of analysing all these stains is as follows:—The stained part is to be boiled in a few drachms of pure water, several times in succession, and the liquid is then filtered, and may be subjected to litmus paper, for the purpose of ascertaining its acidity. The absence of muriatic and sulphuric acids may next be proved, on a drop or two contained in a small glass tube, by the non-action of nitrate of silver on the one hand, and nitrate of baryta on the other. The mixture is then to be rendered neutral, or, for the sake of greater facility, feebly alkaline, by adding a few drops of a diluted solution of caustic potash, after which the whole is evaporated to dryness, and in a vapour bath if practicable. The dry residuum is now to be put into a small short tube, heated with a drop or two of sulphuric acid, and brought in contact with a fragment of morphia, as recommended above, in the process for the pure diluted acid; but if there is any reason to think that the quantity of acid is moderately large, it should be collected pure by a regular process of distillation. (Vide *Christ. on Poisons*, p. 146.)

SULPHURIC ACID, 40.

Oxygen	3 Eqt.	24	40
Sulphur	1 Eqt.	16	

It is a dense colourless liquid; boils at 620—specific gravity 1.847. In its pure state is a powerful corrosive, decomposing both animal and vegetable matter by the aid of heat, causing a deposition of charcoal and formation of water. (Vide *Turner*, p. 282.)

The symptoms of poisoning by this acid are similar to the action produced by the other acids, except that the matter vomited is brown or blackish, and the skin stained brown where it is touched by the acid.

TESTS.

On adding to this acid any of the soluble salts of baryta, a decomposition ensues; the sulphuric acid unites with the baryta, forming sulphate of baryta, which is not acted upon by any other acid; the best salt is the nitrate; the nitric acid being either set at liberty, or uniting with the base, the sulphuric has quitted, forming a nitrate of the base which is held in solution—as nearly all the nitrates are soluble; the sulphuric acid unites with the baryta, forming a white insoluble precipitate, which falls to the bottom of the glass.

There are three other acids which require noticing; they are the concentrated acetic, the oxalic, and hydrocyanic.

ACETIC ACID, 51.

Carbon	4 Eqt.	24	51 Eqt. Number.
Oxygen	3 Eqt.	24	
Hydrogen	3 Eqt.	3	

This acid is the abundant product of the acetous fermentation; it is also obtained from the destructive distillation of wood, and likewise exists either free or combined with an alkali in many plants; in the stomach and in some of the secretions. It is the acidifying principle of common vinegar. It is very sour, volatile, and unites with the alkaline basis, forming neutral salts; the vapour burns with a white light. There are four substances from which the acetic acid of commerce is obtained:—*First*, wine; *second*, malt; *third*, sugar; *fourth*, wood.

It is obtained from the three first by what is called the acetic fermentation; a process which is brought about by exposing the ingredients to the open air, and with a temperature between 70 F. and 80 F. If the temperature is higher, the fermentation will be so violent, that the acetous spirit is weakened; if lower, it takes a much longer time before the acetous fermentation commences.

Rationale.—The base, or intoxicating principle of wine, is alcohol; its composition is this: 3 equivalents of hydrogen, 2 of carbon, and 1 of oxygen. Now, if we take 2 equivalents of alcohol we shall then have 6 equivalents of hydrogen, 4 equivalents of carbon, 2 equivalents of oxygen; 4 additional equivalents of oxygen are absorbed from the air, making 6 equivalents of oxygen present. As the process continues, 3 equivalents of water are given off, and we then have the formula for acetic acid: but perhaps a table will be more explicit.

H.	C.	O.	
6	4	2	..Composition of 2 equivalents of alcohol.
		4	..Equivalents of oxygen, absorbed from the air.
6	4	6	
3	0	3	..Abstract 3 equivalents of water.
3	4	3	..Composition of acetic acid.

The acetic acid obtained from the wood is by a process called destructive distillation; the wood is charred in iron cylinders; numerous gaseous products pass over into receivers, and a very impure acetic acid is thus obtained; to this they add lime, an impure acetate being formed, it is then partially purified, and sulphate of soda is added; double decomposition ensues; a very soluble acetate of soda, and an insoluble sulphate of lime are the result; strain the liquor, evaporate and crystallize; the crystals of the acetate of soda are now to be put into a retort, and sulphuric acid is added; sulphate of soda is formed, and, by the application of heat, the acetic acid passes over.

SYMPTOMS AND TREATMENT.

The symptoms and treatment are the same as the previously mentioned acids. (Vide page 25.)

MORBID APPEARANCES.

The cases of poisoning with this acid are extremely rare. Orfila describes a case of a girl; the back of the tongue was brown and leathery; inner membrane of the gullet blackish brown; extravasation of blood under the submucous cellular tissue of the stomach, producing several hard and black elevations; mucous membrane entire; about eight ounces of thick blackish fluid were contained in the stomach; a thicker pulpy matter of the same colour, adhered to its villous coat.

TESTS.

It has a very peculiar characteristic odour, reddens litmus paper; sulphuric acid decomposes its salts, the acetic acid escaping; known by its pungent vapour.

OXALIC ACID, 36.

Carbon 2 Eqt.........12 } 36 Eqt. Number.
Oxygen 3 Eqt..........24 }

It is found in many plants combined with lime or potash; it gives the pleasant acidity to the rumex acetosa, or commom sorrel, and oxalis acetosella, or wood sorrel. That which is used in commerce is obtained by the action of nitric acid on sugar.

Rationale.—Sugar is composed of 3 equivalents of hydrogen, 3 equivalents of carbom, 3 equivalents of oxygen.

Oxalic acid is composed of 2 equivalents of carbon, 3 equivalents of oxygen.

Now to form oxalic acid you must get rid of 1 equivalent of carbon and 3 equivalents of hydrogen; this is accomplished by the nitric acid yielding a portion of its oxygen, to the hydrogen forming water, and another portion to the corbon, forming carbonic acid gas, which escapes, together with binoxide of nitrogen. It is generally met with in slender four or six-sided prisms, free of odour, and light brownish color; crystals consist of 1 equivalent of acid, and 3 equivalents of water.

SYMPTOMS.

This poison is very rapid in showing its effects. Pain and burning heat in the throat and stomach, vomiting generally present, the matter sometimes mixed with blood; if the patient survives a few hours, there is irritation of the alimentary canal, diarrhæa, and the fæces frequently mixed with blood. The tongue and mouth begin to swell, and become inflamed; the pulse exceedingly weak, sometimes not observable; cold and clammy state of the skin; nervous symptoms frequently show themselves; pain down the loins and limbs, and in the back. Death generally takes place in ten minutes to an hour after taking it; in some cases thirteen hours have elapsed.

TREATMENT.

As the action of this poison is so exceedingly rapid, we cannot be too quick in administering the proper antidotes. Chalk, magnesia, whitening; if these are not at hand, the plaster of the walls and ceiling, must be given in milk. By these means, the poison becomes neutralized; warm water should not be given in this case, as the acid is very soluble, and would therefore, in being dissolved, act upon a greater surface. Having neutralized and counteracted the violence of the poison, you must next attend to the secondary symptoms, and treat them accordingly. They are generally similar to the other corrosive irritant poisons, except that the arterial system may be more disturbed.

MORBID APPEARANCES.

If the patient lies down after taking it, the gullet and stomach appear quite healthy. If the patient has survived some hours, then there are marks of violent inflammation in these parts; softening of their coats, &c. in the stomach; black coagulated blood is found effused, mixed up with the contents of the viscera; in some parts it is dark, and has a gangrenous appearance, in others it is red.

This poison seems to act especially on the heart; it loses its contractile power after death; arterial blood being found in the left ventricles.

TESTS.

This poison may have to be examined in the solid state and in solution. When in the solid state, it must be dissolved, and the solution first tested with litmus paper; if it is acid, that is, if it reddens it, you may next proceed to use the following re-agents.

First.—To a concentrated solution add ammonia; the resulting oxalate of ammonia is much less soluble than the oxalic acid, and a radiated crystallization is the result.

Second.—With nitrate of silver a dense white precipitate falls down, the oxalate of silver; when filtered, dried, and heated, it fulminates.

Third.—Muriate of lime throws down a white precipitate, the oxalate of lime; it is insoluble in muriatic acid, except in large quantities, but is dissolved by a few drops of nitric acid.

Fourth.—Sulphate of copper throws down a greenish white precipitate, the oxalate of copper; it is not dissolved by a few drops of muriatic acid. This distinguishes it from the carbonate and phosphate of copper.

HYDROCYANIC ACID, 27.

Nitrogen	1 Eqt......	14	27, Eqt. Number.
Carbon	2 Eqt......	12	
Hydrogen	1 Eqt.......	1	

ALTHOUGH this substance has a decided acid action, yet it is so feeble as to be decomposed by nearly all the other acids, and even spontaneously.

It is obtained in several ways; *first*, by the action of muriatic acid on the bycyanuret of mercury, by passing sulphuretted hydrogen through a solution, containing the bycyanuret. Or it may be obtained from the bitter almonds, cherry laurels, and peach blossoms. By the action of muriatic acid on the bycyanuret it is decomposed.

Rationale.—

Chlorine	2 Eqt.....	72	74, or 2 Eqt. of mur. acid.
Hydrogen	2 Eqt....	2	

Mercury	1 Eqt..	200	252, or 1 Eqt. of byc. of merc.
Cyanogen	2 Eqt..	52	

The two equivalents of hydrogen unite with the cyanogen, forming 54, or 2 equivalents of hydrocyanic acid, which flies off; the 72, or 2 equivalents of chlorine, unite with the 200, or 1 equivalent of mercury, forming 272, or 1 equivalent of bycloride of mercury, or corrosive sublimate.

The *rationale* of the action of sulphuretted hydrogen is similar.

It reddens litmus paper feebly, and unites with many of the alkaline bases—the resulting salts, called prussiates, or hydrocyanates. Its salts are all decomposed by carbonic acid, and have the peculiar odour of hydrocyanic acid; they are all poisonous. By the application of electricity, it is decomposed and resolved into hydrogen and cyanogen; passed through heated porcelain tubes it is partially decomposed, a portion of undecomposed acid passing over with the nitrogen and hydrogen, and charcoal remaining in the tube. It is combustible, and detonates with oxygen, being resolved into nitrogen, water, and carbonic acid.

It is composed of 1 equivalent of cyanogen and 1 equivalent of hydrogen; cyanogen being composed of 14, or 1 equivalent of nitrogen, and 12, or 2 equivalents of carbon. Its equivalent number is 26; specific gravity 0.9374.

When mixed with water, it has the same odour, but is less volatile, and does not burn. Light decomposes it, therefore it must be secluded from it.

SYMPTOMS.

Of all poisons this seems to be the most speedy and fatal; death taking place from 20 seconds to three or four minutes, according to the strength of the dose; there is nausea, quick, fluttering pulse, great depression of spirits, uneasy sensation of the head (and if the dose is not very strong, salivation and ulceration of the mouth), convulsions, tetanus or coma, terminates life.

If the dose is very strong, the animal falls down as if shot, and usually expires in a few seconds.

TREATMENT.

It is very rare that there is sufficient time to apply any remedies, owing to the fatal rapidity of the poison; but we have three antidotes, which, if they are applied during the convulsions, or even when the comatase state is coming on, give some chance of recovery; these are, the inhalation of diluted ammoniac clorine, and cold effusion. These remedies have been tried by our most eminent toxicologists on animals, with the greatest success.

MORBID APPEARANCES.

If death takes place soon after poisoning, the odour of the acid is very perceptible in the stomach, lungs, blood, and even in the brain; occasional turgescency of the vessels of the stomach, liver, kidneys, and brain; the blood dark, black, or with a bluish cast, and not coagulated; the arteries empty. In a case of poisoning, noticed by Mertzdorff, the bile was altered to a deep blue.

TESTS.

There are four important tests for prussic acid; they are, its odour, salts of copper, salts of the peroxide of iron, and nitrate of silver.

First.—The odour is very peculiar, and resembles the scent exhaled from the peach-blossom.

Second.—Sulphate of copper, rendered slightly alkaline, throws down a greenish precipitate; this is to be treated with a little muriatic acid, to take up some of the oxide of copper thrown down by the potash, and a whitish precipitate is obtained, the cyanide of copper.

Third.—With the mixed salts of the protoxide and peroxide of iron, it throws down the beautiful pigment, prussian blue.

Rationale.—When protosulphate of iron is added to prussic acid containing potash, a portion of it becomes decomposed; the oxygen from the iron unites with the hydrogen from the acid, forming water; and the cyanogen, uniting with the iron, forms a cyanuret of that metal. The cyanuret of iron is dissolved by some undecomposed prussic acid, and ferrocyanic acid results; now, when peroxide of iron is added, a deep blue solution, or precipitate of the ferrocyanate of the peroxide of iron, is immediately formed.

Fourth.—Nitrate of silver throws down a white precipitate, the cyanuret of silver.

Rationale.—The oxygen of the silver unites with the hydrogen of the acid, forming water; and the cyanogen unites with the silver, forming cyanuret of silver; the nitric acid either remains in solution, or unites with the base the prussic acid had left.

THE ALKALIES.

SYMPTOMS.

Hitherto, the alkalies, in a simple state, have never been used, either by the suicide, or for the fatal purpose of murder; but the alkaline carbonates have, and their action resembles that of the concentrated acids. There is an acrid, caustic, and urinous taste, the lining membrane of the mouth and fauces is destroyed; the gullet and stomach suffer in the same manner; there is intense burning pain at the stomach, vomiting of matter, which has a strong alkaline reaction, turning the vegetable blues green, and staining turmeric paper brown. The volatile alkali produces great irritation of the mucous membrane, and acts powerfully on the nervous system, producing spasmodic actions resembling tetanus.

TREATMENT.

The treatment we must have in view, is to neutralise the alkaline as soon as possible; and for this purpose acetic acid or vinegar and water may be given, or the juice of lemons, two tea-spoonsful of the acid in a wine-glass of water;

this ought to be frequently repeated. But a M. Chereau, a French physician, prefers almond or sweet oil, as this not only lubricates the irritated parts, and renders the vomiting less painful, but forms with the alkali a saponaceous compound. His dose was two or three pints.

MORBID APPEARANCES.

There is generally great softening and disorganization of the mouth, fauces and œsophagus; extravasation of blood; softening and great destruction of the villous coat of the stomach.

TESTS FOR THE FIXED ALKALIES.

POTASH, 48.

$$\left.\begin{array}{lll}\text{Oxygen} & 1\ \text{Eqt.}\ldots\ldots\ldots & 8\\ \text{Potassium} & 1\ \text{Eqt.}\ldots\ldots\ldots & 40\end{array}\right\}\ 48,\ \text{Eqt. Number.}$$

THE salts of potash, as a class, are known by their deliquessing, or attracting moisture from the surrounding medium.

On adding tartaric acid, an insoluble salt is precipitated, the super or bitartiate of potash, composed of 48, or 1 equivalent of potash, and 132, or 2 equivalents of tartaric acid, and 9, or 1 equivalent of water.

Muriate of platinum produces a yellow precipitate; a triple salt being formed, composed, according to Turner, of 170, or 1 equivalent of bichloride of platinum, and 76, or 1 equivalent of chloride of potassium.

SODA, 32.

$$\left.\begin{array}{l}\text{Oxygen 1 Eqt.......... 8}\\ \text{Sodium 1 Eqt..........24}\end{array}\right\}\text{32, Eqt. Number.}$$

First.—The salts of soda are known, as a class, by efflorescing; that is, giving off their water of crystallization, and being reduced to powder.

Second.—By having alkaline properties, and by not being precipitated by tartaric acid and muriate of platinum.

Third.—Producing a yellow flame before the blow-pipe.

AMMONIA, 17,

$$\left.\begin{array}{l}\text{Hydrogen 3 Eqts.......... 3}\\ \text{Nitrogen 1 Eqt...........14}\end{array}\right\}\text{17, Eqt. Number.}$$

Or volatile alkali. This is known by its peculiar pungent odour; its salts are distinguished, as a class, by being decomposed by quick-lime, with the evolution of the well-known odour of ammonia.

ANTIMONY, 64.

Antimony is found principally combined with sulphur, in acicular crystals, although it is sometimes met with in the metallic state. It has a bluish grey color, very brittle; specific gravity, 6.7; fuses at 805, and if heated in a covered crucible, to a white heat, when suddenly exposed to the air, it inflames and burns with a white light; the white vapour that rises, is the result of the union of hydrogen with the antimony, forming a protoxide of that metal. According to Berzelius and Turner, this vapour is precipitated in white aucicular crystals, on touching some cool surface. There are three preparations of antimony, which are commonly found in shops: the black sulphuret, the red precipitated sulphuret of antimony, and the tartar emetic.

SYMPTOMS.

The preparations of antimony were formerly thought to be much more poisonous than they are at the present day. After an over-dose has been taken, there is occasional heat, pain, and tightness of the throat; violent vomiting, with sharp twisting and lancinating pains in the stomach; profuse diarrhœa and cramps.

TREATMENT.

Having ascertained that tartar emetic has been taken, and the patient vomits freely, you must try to decompose that which still remains in the stomach, by means of some astringent, as decoction of bark, powdered bark, or tincture of bark; after the vomiting has continued for some time, and you think that a sufficient quantity of bark has been taken, then you must carefully watch the symptoms, for fear of inflammation of the stomach. Soothing, demulcent drinks, combined with opium, prove very serviceable; if the pulse is full and throbbing, and the sickness not abating, then you may take blood with advantage.

MORBID APPEARANCES.

The villous coat of the stomach is generally red, thickened, with a few red spots; but cases of poisoning by antimony are very rare.

TESTS.

Sub-carbonate of potash throws down a white precipitate.

Rationale.—

Carbonic acid	22	Carbonate of potash.
Potash	48	

Tartaric acid	66	Tartar emetic.
Tartaric acid	66	
Potash	48	
Antimony sesq.	76	

The 132, or 2 equivalents of tartaric acid, unite with 96, or 2 equivalents of potash, forming 228, or 2 equivalents of tartrate of potash, which are soluble; the 76, or 1 equivalent of sesqui-oxide of antimony is precipitated, and carbonic acid flies off.

Second.—Sulphuric, nitric, and muriatic acid throw down a white precipitate; on describing the decomposition of one acid, the action of the others is the same, substituting the name of the acid and its equivalent number.

Rationale.—

Sulphuric acid......40

Tartaric acid	66	or 1 Eqt. of tartar emetic.
Tartaric acid	66	
Potash	48	
Oxide of antimony	76	

In this case, according to Turner, the 132, or 2 equivalents of tartaric acid unite with the 48, or 1 equivalent of potash, forming an insoluble bitartrate of potash, which is thrown down; and the 40, or 1 equivalent of sulphuric acid, unite with the 76, or 1 equivalent of oxide of antimony, forming a sub-salt of that metal.

With bitter and astringent infusions, a dirty white precipitate is thrown; supposed to be a compound of oxide of antimony and tannin.

Sulphuretted hydrogen strikes an orange-red color to a solution, containing so small a quantity as an eighth of a grain in an ounce; on the application of heat, the excess of gas is driven off, and a red precipitate falls, the precipitated sulphuret of antimony.

Rationale.—

$$\left.\begin{array}{l}\text{Sulphur......16}\\ \text{Hydrogen.... 1}\end{array}\right\}\text{17, or 1 Eqt. of sulphuretted hydrogen.}$$

$$\left.\begin{array}{l}\text{Tartaric acid.................66}\\ \text{Tartaric acid.................66}\\ \text{Potash........................48}\\ \text{Antimony......64, or 1 Eqt.}\\ \text{Oxygen.........12, or } 1\tfrac{1}{2} \text{ Eqt.}\end{array}\right\}\text{or 1 Eqt. of tartar emetic.}$$

The hydrogen of the sulphuretted hydrogen unites with a portion of the oxygen from the oxide of antimony, and forms water; the sulphur unites with the antimony and remaining half an equivalent of oxygen, forming the red precipitated sulphuret of antimony, which falls down; the tartaric acid unites with the potash, forming super or bitartrate of potash.

If you take the red precipitated sulphuret of antimony, and pass hydrogen gas over it, the hydrogen unites with the sulphur, forming sulphuretted hydrogen, which escapes, and metallic antimony is left.

ARSENIC, 37.

This metal is occasionally found native, but it is chiefly procured, from its combination with cobalt, iron, and other metals, by roasting them in reverberatory furnaces ; owing to its volatility, it is expelled, and, as it rises, unites with oxygen of the atmospheric air, forming an oxide, which condenses in the upper part of the chimney. If this is exposed, with black flux, to a red heat in a covered crucible, the arsenicum, or metallic arsenic, collects on the upper part of the crucible. The theory of the changes will be explained when pointing out the test of reduction for arsenic.

The metallic arsenic, thus obtained, is of a bluish white color, very brittle, with a laminated structure, and strong metallic lustre ; in the open air it easily tarnishes, changing first to a yellowish, and then to a brownish black color ; its specific gravity is 5.8843 ; according to Turner, sublimes at 356 F.; its vapour has the peculiar odour of garlic, which is very characteristic of this metal.

There are six preparations of arsenic, which are commonly met with in the shops, viz., arsenious acid, commonly known as white arsenic; arsenite of copper, or mineral green; arsenite of potash, as in Fowler's solution; arseniate of potash; the sulphurets; and fly powder, which, according to Berzelius, is an oxide.

SYMPTOMS.

The first symptoms of poisoning by arsenic appear very shortly after it has been taken, generally ten minutes; there is heat, pain, and constriction of the pharynx and œsophagus; vomiting, with a burning pain at the region of the stomach; this is followed by great anxiety of the countenance, and frequent syncope; the lips and mouth become parched and inflamed; difficulty of speech and hoarseness of the voice; intolerable burning heat at the precordia, the mildest liquid giving the greatest pain, although the desire for drink is incessant; the alimentary canal may become affected in its whole extent, either a profuse and fœtid diarrhœa or tenesmus being present; the urinary organs participate in the general excitement of the system, the urine scanty, dark colored, bloody, or entirely suppressed; the penis is swelled, and there is a painful and difficult micturition, with pain over the hypogastric region. In the female, there is heat, pain, swelling, and excoriation of the labia.

Pulse variable; there is occasional tightness about the diaphragm, and difficulty of breathing; swelling and dark circle round the eye-lids; a milliary irruption occasionally breaks out; great prostration of strength; paralysis of the hands and feet; convulsions; death.

These symptoms are not present in every case, and seem to depend, in some measure, on the peculiar idiosyncrasy of the individual. In some rare cases, they are altogether entirely wanting. Mr. Chaussier mentions a case of a man swallowing a large dose of arsenious acid in fragments, and died, no symptoms being present, except syncopes; on opening him, the intestinal canal was healthy, and the arsenious acid in the same state as when he swallowed it.

If not in every case, still in a great many, the chief part of these symptoms will appear; but if, by any remains of the poison, we are satisfied that arsenic has been taken, although some time has elapsed and the patient seems tranquil, we must, nevertheless, use the remedies prescribed below, and not trust to the inefficacy of this subtle poison by the slight apparent symptoms.

TREATMENT.

Numerous antidotes have, from time to time, been offered to the medical world, but, as Dr. Christoson justly remarks, "arsenic, in all its combinations, acts in a ratio to its solubility, and that, since there is no substance, which, combining, renders it insoluble in the acids of the stomach, so there can be no antidote; and in trying them, we lose much valuable time without the least chance of success. The best remedies we can employ are the white of eggs, or albumen and milk; by the acids of the stomach, they become coagulated, and form a meshwork, taking up, in their interstices, any portion of the yet undissolved arsenic; if vomiting has not yet come on, the sulphate of zinc emetic ought to be given, or the fauces irritated by the finger, which, if it has effect, is preferable to the sulphate of zinc; after each vomiting, small quantities of milk, albumen, or mucelaginous fluids, should be given, for these reasons: *first*, that the stomach may entirely eject it, and the mucous secretion lining its surface, to which the arsenic adheres closely; *secondly*, the patient weakens himself by painful retchings, unless some fluid is given after vomiting; *thirdly*, it ought to be given in small doses, for if too great a quantity of fluid is taken, the stomach cannot fully contract; therefore, some of the poison is liable to remain.

Some persons have recommended the use of the stomach-pump, and washing the stomach out often with some bland fluid; but I think vomiting is better in this case, if it can be promoted, as numerous little particles of the powder are liable to get between the rugæ of the lining membrane, adhering to the mucus, and are not taken up by the pump; whereas, by the constant contraction of the stomach on itself during vomiting, all its contents are expelled. After the vomiting has continued some time, and several draughts of milk, &c., have been given, and by the quantity of fluid brought off the stomach, you have reason to believe the poison is entirely removed, then the patient must be treated as labouring under gastritis, or inflammation of the stomach.

If the vomiting has not come on by your irritating the fauces with the finger or a feather, and an emetic has been given, then the stomach-pump had better be used, in preference to too violent emetics, as they only serve to produce greater irritation."

In No. VI. of the *Medical Gazette*, there is an article on the use of the hydrated tritoxide of iron, used as an antidote for arsenic. Dr. Bussen, the discoverer, has used it in several cases with great success; it seems to unite with the arsenious acid, forming an inert salt.

METHOD OF PREPARING IT.

Take half an ounce of iron filings, two ounces of muriatic, and two of nitric acid, place them in a pipkin near the fire; the iron becomes oxidated at the expense of the nitric acid, a nitric muriate of iron results; add half a pint of distilled water to it, then remove the vessel from the fire, and pour in one ounce and a half of liquid ammonia, a precipitate falls, which is the oxide of iron;

the ammonia uniting with the acids, the precipitate must be well washed. Dose, one ounce every hour.

MORBID APPEARANCES.

There is little discoloration of the membrane lining the mouth, pharynx, and œsophagus, although in some cases it is present. The stomach is the organ that suffers most; deep red patches of inflammation are seen on its surface; extravasation of blood between its layers, producing brownish or black spots, and also in the stomach there are occasional ulceration and perforation.

TESTS.

Having taken out the stomach in the manner laid down in the first chapter, we shall now proceed to test it for arsenic. It may exist either in solution, in a solid state, or in mixture: first, we will proceed to detect it in solution. For this, there are five tests which are employed; the ammoniacal nitrate of silver, the ammoniacal sulphate of copper, sulphuretted hydrogen, arseniuretted hydrogn, and reducing it to the metallic form. The best way to form the ammoniacal nitrate of silver is to make a solution of lunar caustic; drop into it ammonia, till the oxide of silver first thrown down is nearly all taken up; add this to a portion of the suspected liquid, and, if arsenic is present, a bright lemon yellow precipitate will fall down.

Rationale.—

$$\left.\begin{array}{l}\left.\begin{array}{lr}\text{Nitrogen 1 Eqt..} & 14\\ \text{Oxygen..5 Eqt..} & 40\end{array}\right\}54=1\text{ Eqt. of nitric acid..}\\ \left.\begin{array}{lr}\text{Silver ... 1 Eqt..} & 108\\ \text{Oxygen..1 Eqt..} & 8\end{array}\right\}116=1\text{ Eqt. of oxide of silver}\end{array}\right\}\text{nitrate of silver.}$$

$$\left.\begin{array}{lr}\text{Nitrogen.. 1 Eqt. ..} & 14\\ \text{Hydrogen . 3 Eqt. ..} & 3\end{array}\right\}17=1\text{ Eqt. of ammonia.}$$

$$\left.\begin{array}{lr}\text{Arsenicum 1 Eqt. ..} & 37\\ \text{Oxygen.... }1\tfrac{1}{2}\text{ Eqt. ..} & 12\end{array}\right\}\begin{array}{l}49=1\text{ Eqt. of arsenious}\\ \text{acid.}\end{array}$$

In this case, the 54, or 1 equivalent of nitric acid, unites with 17, or 1 equivalent of ammonia, forming 71 parts, or 1 equivalent of soluble nitrate of ammonia; 49, or 1 equivalent of arsenious acid unites with 116, or 1 equivalent of oxide of silver, forming 165, or 1 equivalent of arsenite of silver, which is precipitated.

Second.—Ammoniacal sulphate of copper is formed in the same manner as the ammoniacal nitrate of silver. It throws down a green precipitate, called Scheel's green, when added to a solution containing arsenious acid. The theory of the decomposition is similar to that of the silver, only substituting ammoniacal sulphate of copper for the ammoniacal nitrate of silver. The resulting compounds being sulphate of ammonia and arsenite of copper, or Scheel's green.

Third.—In passing a stream of sulphuretted hydrogen into a solution, containing arsenic, the fluid becomes immediately yellow and turbid; on boiling, so as to expel the excess of sulphuretted hydrogen, a lemon-yellow precipitate is thrown down, the sulphuret of arsenicum, or orpiment; but it is necessary to ensure the success of this test, that the solution be not alkaline; for this purpose, a slip of turmeric paper may be dipped in; if it is turned brown, the solution is too alkaline, and must be acidulated with acetic acid; if there is an excess of either nitric or sulphuric acid, &c., they may be neutralized with potash.

Rationale.—For the theory of this decomposition, we take two equivalents of arsenious acid and two equivalents of sulphuretted hydrogen.

$$\left.\begin{array}{lll}\text{Arsenicum} & 2\text{ Eqt.} \;.. & 74\\ \text{Oxygen} \;.. & 3\text{ Eqt.} \;.. & 24\end{array}\right\} 98 = 2\text{ Eqt. of arsenicum acid.}$$

$$\left.\begin{array}{lll}\text{Sulphur} \;.. & 2\text{ Eqt.} \;.. & 32\\ \text{Hydrogen} & 2\text{ Eqt.} \;.. & 2\end{array}\right\} 34 = 2\text{ Eqt. of sulphuretted hydrogen.}$$

The 2, or 2 equivalents of hydrogen from the sulphuret, unite with the oxygen of the acid, forming 18, or 2 equivalents of water; the 32, or 2 equivalents of sulphur, unite with the 74, or 2 equivalents of arsenicum, forming 106, or 2 equivalents of the yellow sulphuret of arsenicum; the other equivalents of oxygen, perhaps, unite with the hydrogen of the water, forming 1 equivalent of bin, or peroxide of hydrogen.

Fourth.—The arseniuretted hydrogen is said to be a test of great delicacy. To perform it, you must take iron or zinc filings, sulphuric acid and water, and place them in a stoppered glass retort; the metal abstracts oxygen from the water, liberating hydrogen; if arsenic is placed in the solution, the hydrogen unites with it, and flies off as arseniuretted hydrogen; when ignited at the mouth of the retort the hydrogen unites with oxygen from the air, forming water, and on placing a piece of glass over the flame (not too close), the arsenic will be condensed on it in the form of a ring of shining crystals.

Rationale.—In the above process the use of the acid is to take up the oxide of the metal as soon as produced, otherwise it would form a coat round the iron or zinc, and stop the process.

Fifth.—Reduction; to perform this test you mix sulphuret of arsenicum, obtained by the third process (first carefully dried), with black flux, which is composed of

Carbon....	1 Eqt..	6	22, or 1 Eqt. carb. acid.	70, or 1 Eqt. of carbonate of potash & charcoal.
Oxygen ...	2 Eqt..	12		
Potassium.	1 Eqt..	40	48, or 1 Eqt. of Potash	
Oxygen....	1 Eqt..	8		

Pure charcoal.

To explain the changes that ensue on the application of heat, it is necessary that we have four equivalents of carbonate of potash; the sulphuret of arsenicum becomes decomposed, as well as the carbonate of potash; 1 equivalent of the sulphur takes 3 equivalents of the oxygen from the potash, leaving 3 equivalents of potassium, forming 1 equivalent of sulphuric acid, which unites with some undecomposed potash, forming sulphate of potash; 3 other equivalents, or portions of the sulphur, unite with 3 equivalents of potassium, forming 3 equivalents of sulphuret of potassium; the carbonic acid and arsenicum are set free by means of heat; the arsenicum rises in vapour, and is condensed on the cool part of the receiver, that part next the glass having a beautiful metallic lustre; the internal surface has a crystalline appearance, like the fracture of cast iron.

Its crystalline texture is best seen by some low magnifying power. By applying heat to the crystals, they again become volatilized, and are condensed on that part which is cool; in this manner you may make it traverse the tube at pleasure. The use of the charcoal seems to be to take up any free oxygen; we have, therefore, in the tube, arsenicum, carbon, carbonic acid, sulphuret of potassium, and sulphate of potash.

These five tests, taken as a body, are very conclusive; but singly, they might lead to error. If only the ammoniacal nitrate of silver was used, and the yellow precipitate fell down as usual, unless following it up by the other tests, you could not positively state whether it was phosphate or arsenite of silver before you, as the phosphate of silver is yellow. So again with the ammoniacal sulphate of copper. It produces a green colour to a solution of bichromate of potash, and in some mixed fluids causes green precipitates, when no arsenic is present. Arsenite of copper is dissolved by tannin; this may be the reason why, in infusion of tea, containing arsenic, no precipitate is thrown down; but, in pure water, Scheel's green is always precipitated. In using sulphuretted hydrogen alone, this test is open to the same fallacies, if judged of only by colour, as the sulphurets of selenium, cadmium, tin and antimony, resemble orpiment.

IN ITS SOLID STATE.

Take a small green glass tube, and put into it the substance suspected to be arsenic, mixed with black flux, or pure charcoal; the arsenious acid becomes decomposed, its oxygen combines with the charcoal, forming carbonic acid; the arsenicum sublimes, and is condensed on the sides of the tube, in its metallic state; heat it again, so that it may be volatilized; charcoal not being present, it takes oxygen from the air, forming arsenious acid, which is known by its peculiar garlic-like odour, as also by dissolving it in pure distilled water, and applying the appropriate tests for solution.

IN MIXTURES.

When mixed up with the contents of the stomach, we must endeavour to obtain a clear solution. The stomach must be cut into shreads, and placed with its contents in a Florence flask; distilled water and a little liquor potassæ being added, let it boil some time; the arsenic is taken up; strain the liquid through fine linen, and filter through blotting paper; add the ammoniacal nitrate of silver. If this test does not throw down the arsenic, Christison recommends evaporating carefully the solution to dryness, not allowing the heat to be too great at the close of the operation; dissolve the residue in distilled water, filter, set aside to cool: the solution must now be tested by its proper re-agents.

BARIUM, 68.

Barium, the metallic base of baryta, has a dark grey colour, with a lustre inferior to that of cast-iron; exposed to the air, owing to its great attraction for oxygen, it soon becomes covered with a white powder, which is the oxide of barium or baryta. When thrown into water, hydrogen escapes with effervescence; the oxygen of the water going to the metal, and the hydrogen flies off. The carbonate and muriate are those salts of baryta which are most commonly met with in shops. It is very rare that baryta, or any of its salts, are taken by accident, or for the purpose of destroying life, yet a case or two of poisoning by this substance have occurred.

SYMPTOMS.

Head-ache, nausea, vomiting, great prostration of strength, profuse diarrhœa, cold sweats, convulsions, and death.

MORBID APPEARANCES.

There is no detailed account of the morbid appearance in man; it seems to exert a powerful influence on the nervous system; in animals, if they expire shortly after the poison has been taken, the viscera are healthy; if they have lived some time after, the stomach is inflamed and red, the brain and its membranes much gorged with blood.

TESTS.

The carbonate of baryta is known by its dull white colour, its insolubility in water, by the action of muriatic acid, which unites with the baryta, the carbonic acid escaping with the effervescence; the resulting muriate crystallizes freely by evaporation in tables of four, six, or eight sides; insoluble in alcohol; not acted on by sulphuretted hydrogen, but sulphuric acid, producing a white precipitate, which is insoluble in nitric acid.

BISMUTH, 71.

Bismuth is found, both native and mixed, with arsenic, oxygen, sulphur, iron, &c.; it has a yellowish or reddish white colour, and metallic lustre; a highly lamellated structure. On slowly cooling a fused mass, and allowing the internal coat to get hard, then perforate it, so that the still fluid metal may escape from the inside, on sawing through the mass the interior will present a most beautiful appearance of crystallization. Brittle when cold, yet may be formed into plates while warm; sublimes by a strong heat, in a covered vessel; forms alloy with metals.

Its combination with nitric acid forms a powerful poison, though very rarely used. The only case I have heard of, is mentioned in that excellent work on poisons, by Dr. Christison: a man subject to pyrosis, or waterbrash, took two drachms of the subnitrate with cream of tartar, by mistake, for a mixture of chalk and magnesia.

SYMPTOMS.

"He was immediately attacked with a burning in the throat, brown vomiting, watery purges, cramps and coldness of the limbs, with intermitting pulse; then with inflammation of the throat, difficult swallowing, dryness of the membrane of the nose, and a constant nauseous metallic taste; on the third day, with hiccough, laborious breathing, and swelling of the hands and face; suppression of urine, which had existed from the first; on the fourth day, swelling and tension of the belly were added to the other existing symptoms; on the fifth day, salivation; on the sixth, delirium; on the seventh, swelling of the tongue, and enormous enlargement of the belly; on the ninth, he died; with the urine suppressed till the eighth day.

MORBID APPEARANCES.

"Scarcely any part of the alimentary canal, from the mouth to the rectum, was free from disease. The tonsils, uvula, pharynx, epiglottis, and larynx were gangrenous; the gullet livid; stomach very red, with numerous purple pimples; the whole intestinal canal red, here and there gangrenous, especially at the rectum; inner surface of the heart was red; kidneys and brain healthy."

TESTS.

The sub nitrate, or magistery, of bismuth may be easily distinguished, by its insolubility in water, and yielding a globule of metallic bismuth, when heated before the blow-pipe, mixed with a little soda and powdered charcoal or oil.

COPPER, 31,

Is found both native and in combination; that which is used in commerce, is obtained by roasting the copper pyrites; a portion of the sulphur is dissipated, the residue is then mixed with unroasted ore and some siliceous substance, and fused, a slag rises to the surface, composed of silica and black oxide of iron; a portion of the sulphur still adheres to the copper, but, by continuing the process of roasting for some considerable time, the sulphur takes oxygen from the air, and flies off as sulphurous acid gas, leaving the copper in the state of an oxide; on mixing this with charcoal, and exposing it to heat, the carbon unites with the oxygen, forming carbonic acid, which flies off, and the metal is reduced; but it is not yet fit for commerce; it is again melted, and a jet of air is made to play upon it, so that, if there are any impurities, which are generally iron and sulphur, they may be oxydized, as they have a greater affinity for oxygen than the copper. It is hard, sonorous malleable, and ductile, of a reddish brown colour, and capable of receiving a good polish.

According to Orfila, there are no less than ten preparations of copper, which are commonly met with, that are poisonous :

Acetate of Copper.
Ammoniacal Copper.
Brown oxide of Copper.
Copper dissolved in grease.
Coppery wine and vinegar.
Muriate of Copper.
Nitrate of Copper
Sulphate of ammoniacal Copper.
Sulphate of Copper.
Verdigris.

SYMPTOMS.

The symptoms of poisoning by copper, are thus stated by Orfila : an acrid, styptic taste in the mouth ; parched and dried tongue ; a sense of strangulation in the throat ; coppery eructations ; continual spitting ; nausea ; copious vomitings, or vain efforts to vomit ; shooting pains in the stomach, which are often very severe ; horrible gripes ; very frequent alvine evacuations, sometimes bloody and blackish, with tenesmus and debility, the abdomen puffed up and painful ;

pulse small, irregular, tight, and frequent; syncope; heat of the skin; ardent thirst; difficulty of breathing; anxiety of the præcordia; cold sweats; scanty urine; violent head-ache; vertigos; faintness; weakness in the limbs; cramps; convulsions; and death.—Vide *Orfila on Poisons*. These symptoms vary in different persons; the vomiting and severe cholic pains are rarely absent. When mortification of the intestines comes on, there is a cessation of pain, the pulse sinks rapidly, the countenance becomes very anxious, cold sweats break out, hiccough, and death soon follows.

TREATMENT.

Orfila finds that albumen is the best antidote, uniting with the copper, forming an inert compound. Mucilaginous clysters should be thrown up, as also a milk diet must be insisted on; if the tongue should become much furred, no sickness, and sharp cholic pains flying about the abdomen, an emetic might prove useful. Mr. Jeanroy treated four cases very successfully. He first gave milk, and administered mucilaginous injections; two out of the four were cured by this treatment; the other two having their tongues much furred, with violent pains in the head and stomach, contractions of the limbs, and profuse sweats, he gave the husband two, and the wife three grains of tartar emetic; it produced vomiting of a greenish bile, with lumps of coagulated milk; the patients experienced much relief; for their ordinary drink, he gave them a strong decoction of marsh-mallows; besides which, he gave two spoonsful of the following mixture every half-hour: six ounces of oil of sweet almonds, two ounces of syrup of marsh-mallows, and an ounce of the syrup of diacodium (a composition made of the heads of poppies). He likewise applied clysters, every two hours, made of olive oil and linseed; the patients also took some fat broth every four hours. By this plan of treatment they were soon out of danger. Sugar has been repudiated by Orfila, as having no more than demulcent properties; therefore, it is of no use so long as the poison remains in the stomach.

MORBID APPEARANCES.

The skin is generally yellow; the internal parts may vary according to the quantity of poison taken, and the form in which it was administered; small apthæ in the mouth, redness of the gullet, preternatural greenness of stomach and intestines; inner coat of the stomach inflamed, and in places much thickened, some parts resembling horn; occasionally the intestines are perforated.

TESTS.

Copper may either require to be tested in the solid form, in solution, or in the state of mixture.

In the solid form, it must be ignited before the blow-pipe, on a piece of charcoal, which will dispel the substance the copper may be combined with; a small globule of the pure metal will remain. This is to be dissolved by nitric acid, one equivalent of oxygen quits the acid, uniting with the copper, oxydizes it, and forms protoxide of the metal, which unites with some undecomposed acid, forming nitrate of the protoxide of copper; the other four equivalents of oxygen of the nitric acid uniting with the nitrogen, fly off as red nitrous acid fumes. The nitrate of copper is of a deep blue color; it is to be dissolved in distilled water, and a solution formed.

Test for copper in solution. First.—A small quantity of ammonia dropped in, throws down a beautiful light blue precipitate, the disulphate of copper; but, on adding more ammonia, the precipitate is taken up, and a dark blue colored solution is the result; a triple salt being formed, the sulphate of copper and ammonia. If the sulphate of copper (and I have selected the sulphate, merely as an example, as the results are the same with the other salts of this metal) be in small quantities, no precipitate takes place, but the solution acquires a depth of blue color, proportionate to the salt present.

Second.—Ferrocyanate of potash throws down a brown precipitate, the ferrocyanate of copper.

Rationale.—We will suppose, for instance, that the acetate of copper is in solution. It is composed of—

Copper	1 Eqt.	31	39 or 1 Eqt. of prot. of copper	89 or 1 Eqt. of acetate of copper.
Oxygen	1 Eqt.	8		
Carbon	4 Eqt.	24	50, or 1 Eqt. of acetic acid	
Oxygen	3 Eqt.	24		
Hydrogen	2 Eqt.	2		

Ferrocyanic acid is composed of—

Carbon	2 Eqt.	12	26, or 1 Eqt. of cyanogen.
Nitrogen	1 Eqt.	14	

Cyanogen	3 Eqt.	78	108, or 1 Eqt. of fer. cyan. acid	156 or 1 Eqt. of ferrocyanate of potash.
Hydrogen	2 Eqt.	2		
Iron	1 Eqt.	28		
Potassium	1 Eqt.	40	48, or 1 Eqt. of potash	
Oxygen	1 Eqt.	8		

The 48, or 1 equivalent of potash, unites with the 50, or 1 equivalent of acetic acid, forming 98, or 1 equivalent of the acetate of potash, which remains in solution. The 108, or 1 equivalent of ferrocyanic acid, unites with the 39, or 1 equivalent of the protoxide of copper, and 147, or 1 equivalent of ferrocyanate of copper, is thrown down.

Third.—A clean metallic iron plate, introduced into the solution, and rendered slightly acid, if copper be present, it will become coated with a reddish brown crust of metallic copper.

Rationale.—Iron has a greater affinity for acids than copper, and, by simple elective affinity, displaces the copper, salt of iron being held in solution, while the copper is precipitated in the metallic state.

Arsenious acid and ammonia throws down Scheel's green, an arsenite of copper. (*Vide* p. 59.)

To discover copper in mixtures.—Take the mixture, boil it, then add dilute acetic acid, which dissolves out the copper; filter the solution, wash the residuum left, and refilter. Pass a current of sulphuretted hydrogen through the solution. If copper is present a brown sulphuret is thrown down; take the precipitate and reduce it on charcoal. (*Vide*, Test for copper in the solid state, p. 73.)

Dr. Christison justly remarks, that some insoluble salt of copper might remain on the filter; he first dries the unfiltered matter, and exposes it to a red heat, so that nothing but the metallic copper remains; he then adds nitric acid, diluted with its weight of water, which dissolves the copper; and then proceeds to test the solution.

GLASS.

Under this head is meant bodies of a flinty nature. A great deal has been said, to prove that pounded glass is perfectly innocuous, that it neither acts locally nor chemically; but I firmly believe, that although it can at times be taken with impunity, still the lining membrane of the stomach and intestines is liable to be punctured; and if this be the case, great irritation, inflammation, and ulceration, may be the consequence. It is a remarkable fact, that glass-eaters generally die of some intestinal disease.—*(Ploquet sur les Morts Violentes.)*

Mr. Hebb, of Worcester, has published the case of a child, eleven months old, who died after a few days' illness; there was a tough layer of mucus, streaked with blood, lining the stomach; numerous particles of glass were seen sticking to the villous coat, which was highly vascular; some of them were nearly in contact, others more deeply inserted.—(*Vide Midland Medical and Surgical Reporter*, I., 47, 1828.)

TREATMENT.

In such a case, the practitioner has little to do. If emetics are given, by the contractions of the stomach the glass becomes more deeply imbedded; and if purgatives, you run the risk of injuring the whole of the intestinal canal. Mr. Portal (*see* his work on mephitic vapours) was called to attend a case; he made the patient fill his stomach with food, that it might take up the glass. He then gave an emetic; the patient vomited up the food, with the glass mixed with it; he then made him drink milk. Under this treatment he finally recovered.

GOLD, 200,

Is either found native or in combination. It is generally separated from its impurities, by the process of amalgamation. The best mode of separating gold, according to Dr. Turner, is to fuse it with silver, with which it unites; then separate the silver by nitric acid.

It is of a beautiful yellow color, by reflected light, and green by transmitted; the most ductile and malleable of all metals, but others exceed it in tenacity; its density is 19.3. It is unaltered and fixed, either when exposed to the atmosphere, or to the strongest heat of the furnace. It is oxydised by passing the electric shock through a thin leaf; the oxide is of a purple color.

The muriate and fulminating gold are those which we shall have to look after. It is very rarely used for the destruction of life.

SYMPTOMS.

Pain, heat, and griping of the stomach, followed by nausea and vomiting; salivation, diarrhæa, cold clammy sweats, great anxiety of the countenance, cramps, syncope, convulsions, and death.

TREATMENT.

Albumen or milk ought to be given immediately, as they become coagulated by the acids of the stomach; when vomiting ensues, mucilaginous and demulcent liquids must be used, as they render the vomiting more easy. General and local bleeding will be necessary, to keep down the severe inflammation which is likely to result.

MORBID APPEARANCES.

The stomach is the organ that chiefly suffers. The appearances show the powerful corrosive properties of this poison; mucous membrane very red, much ulcerated, and sometimes perforated.

TESTS.

For the muriate of gold. First.—Easily reduced on charcoal, before the blow-pipe, the muriatic acid being driven off.

Second.—The solution stains the skin purple.

Third.—Ammonia throws down a bright yellow precipitate; dry this carefully, with a very gentle heat, and the fulminating gold will be formed. In this case, the ammonia being in excess, the muriatic acid unites with it, forming a muriate of ammonia; another portion of the ammonia unites with the liberated oxide of the metal, forming fulminating gold.

Rationale.—Dumas, in his analysis, supposes that 2 equivalents of ammonia unite with 1 equivalent of peroxide of gold; therefore, its equivalent number is 258.

$$\left.\begin{array}{l}\left.\begin{array}{lll}\text{Nitrogen} & 2\text{ Eqt.}\,. & 28\\ \text{Hydrogen} & 6\text{ Eqt.}\,. & 6\end{array}\right\}\text{34, or 2 Eqt. of ammonia}\\ \left.\begin{array}{lll}\text{Gold} & 1\text{ Eqt.}\,. & 200\\ \text{Oxygen} & 3\text{ Eqt.}\,. & 24\end{array}\right\}\text{224, or 1 Eqt. peroxide of gold}\end{array}\right\}\text{258, or 1 Eqt. of fulminating gold.}$$

When a small portion of this fulminating gold is heated, it explodes most violently, and gold, nitrogen, ammonia, and water, are the results.

Fourth.—Proto-muriate of tin throws down a purple precipitate, called purple of cassius. The decomposition here is not well understood; Dr. Turner thinks the purple precipitate is a hydrated double salt, composed of peroxide of tin and binoxide of gold.—(*Turner's Chemistry*, p. 610.)

Fifth.—Albumen throws down a yellow flaky precipitate.

CALCIUM, 20.

Calcium, the metallic base of lime, is of a white color; by exposure to the air, it absorbs oxygen, forming the well known substance, lime.

Lime is the protoxide of calcium. It is a brittle, greyish white, earthy solid, very infusible, acted on only by the oxygen hydrogen blow-pipe; specific gravity 2.3. It has a caustic, astringent, and alkaline taste; soluble in cold as in warm water, 760 parts of which takes up only one of lime. It is obtained for commerce, by calcining the carbonate of lime or chalk; the heat drives off the carbonic acid, leaving the lime pure.

SYMPTOMS.

Its action is not very powerful, it may produce some irritation, and consequent inflammation; but it is, nevertheless, a substance of little interest.

TREATMENT.

If a person has taken lime, the best antidote is acetic acid or common vinegar; the lime becomes neutralized, and may be brought off by vomiting. Inflammation must be kept down by bleeding and leeches. If an apperient is required, castor oil may be given.

TESTS.

First.—Lime water turns syrup of violets green, and stains turmeric paper brown.

Second.—If carbonic acid be passed into lime water, the solution becomes turbid, but the precipitate is taken up by an excess of carbonic acid.

Rationale.—The carbonate of lime, formed in the first instance, is insoluble in water; but another equivalent of the acid unites with it, forming a bicarbonate, which is perfectly soluble.

Third.—Oxalate of ammonia throws down the oxalate of lime, which is the most insoluble of all the salts of lime; nitric acid decomposes it, a nitrate of lime being formed. This is distinguished from the nitrate of strontia and baryta, by being very deliquiscent, and very soluble in alcohol; the other two are not deliquiscent, and are very insoluble in alcohol.

MERCURY, 200.

Mercury is sometimes found native, but the greatest part used in commerce is obtained from cinnabar, a sulphuret of mercury.

The cinnabar is mixed with lime; heat applied, and the mercury volatizes, and is condensed by cold.

Rationale.—To explain this decomposition, four equivalents, or portions, of each of the ingredients are required.

Calcium	4 Eqt..	80	112, or 4 Eqt. of lime.
Oxygen	4 Eqt..	32	
Mercury	4 Eqt..	800	864, or 4 Eqt. of cinnabar, or sulphuret of mercury.
Sulphur	4 Eqt..	64	

24, or 3 equivalents of the oxygen, unites with 16, or 1 equivalent of sulphur, forming 40, or 1 equivalent of sulphuric acid; 20, or 1 equivalent of calcium, unites with the remaining equivalent of oxygen, forming 28, or 1 equivalent of lime, which, uniting with the sulphuric acid, 68, or 1 equivalent of sulphate of lime, is the result; the 48 or 3 remaining equivalents of sulphur, unite with 60, the 3 equivalents of calcium forming 108, or 3 equivalents of the sulphuret of calcium; the 800, or 4 equivalents of mercury, rises in vapour.

Mercury is fluid at common temperatures, of a bluish white colour, great metallic lustre and specific gravity, which is 13.6; according to Dr. Ure, boils at 656° Far., freezes at 39 degrees below zero. It unites with metals, forming amalgams.

There are no less than seven preparations of mercury which are commonly met with, they are:—*first*, the protochloride or calomel; *second*, the bichloride or corrosive sublimate; *third*, the bisulphuret or vermilion; *fourth*, the subbisulphate, or turbith mineral; *fifth*, the peroxide or red precipitate; *sixth*, the cyanide of mercury; and *seventh*, the nitrate of mercury.

SYMPTOMS.

As the corrosive sublimate is the most active and most common, I shall describe the symptoms that ensue from taking it; the other preparations of mercury act in a similar manner, but less violently. On swallowing the poison, there is at first a peculiarly disagreeable taste, followed by a sense of constriction of the throat; inflammation of the lining membrane of the mouth, burning and soreness of the throat, extending down to the stomach, great burning heat, rending and excruciating pains in the stomach, the patient expressing the sensation like fire; vomiting, especially on attempting to swallow; the matter sometimes mixed with blood; intense pain, extending down the belly, great tenderness on pressure, profuse diarrhœa, occasionally mixed with blood; there is sometimes great irritation of the urinary organs; the face swelled, and flushed; eyes sparkling, with contracted pupil; clammy sweats break out, twitches of the extremities and convulsions; stupor, coma, or paraplegia are occasionally witnessed, and death occasionally takes place within the thirty-six hours. In some there is mercurial erethysm, which is characterised, according to Mr. Pearson, by great depression of strength, anxiety about the præcordia, irregular action of the heart, frequent sighing, a small, quick, sometimes intermitting, pulse; occasional vomiting, a pale contracted countenance, and a sense of coldness; but the tongue is seldom furred, nor are the vital and natural functions much disturbed. In this state any sudden exertion will prove fatal. Mercurial erethysm generally supervenes after the exhibition of the milder mercurials, or even corrosive sublimate, when in a diluted state.

There is another state of the constitution depending on the action of mercurials, that is, the shaking palsy, or tremblement mercurial. This disease is chiefly confined to the individuals employed in using mercury, as manufacturing looking-glasses, barometers, &c., and those exposed to its influence in mining.

In *Christison on Poisons*, there is an excellent description of this disease as taken from Merat's Appendix to his *Traité de Colique Mitallique*, p. 275. "The disease," says he, "may sometimes begin suddenly; but in general it makes its approaches by slow steps. The first symptom is unsteadiness of the arms, then quivering, finally tremors; the several movements of which become more and more extensive, till they resemble convulsions, and render it difficult or impossible for the patient to walk, to speak, or even to chew. All voluntary motions, such as carrying a morsel to the mouth, are effected by several violent starts. The arms are generally attacked first, and also most severely. If the man does not now quit work, loss of memory, sleeplessness, delirium, and death ensue. But, as the nature of the disease soon renders working almost impossible, he cannot well continue; and in that case death is rare. The concomitant symptoms of the trembling are a peculiar brown tint of the whole body, dry skin, flatus, but no colic; no disorder of respiration, and excepting in very old cases, no wasting or impared digestion: pulse is almost always slow."

TREATMENT.

The treatment of persons labouring under the influence of mercury is divided into two parts:—*First*. When the irritation of the alimentary canal and its neighbouring parts is most prominent. *Secondly*. When the system is labouring under mercurial erethysm.

First.—Orfila has presented to the medical practitioner a most invaluable antidote for corrosive sublimate in albumen and gluten; the white of eggs must be beat up with water, and a wine glass given at short intervals; the poison becomes immediately decomposed and resolved into protochloride of mercury and albumen, which is harmless.

If albumen cannot be readily obtained, then milk must be given, or decoction of linseed, or marshmallows, sugared water, or lukewarm water; so that by taking some one of these remedies the stomach may be filled with liquid, and the energy of the bichloride weakened.

A great portion of the poison will be rejected by vomiting, which should be kept up by drinking copiously of some of the above liquids. In the mean time, for greater safety, some white of egg may be obtained, and the patient made to swallow it, mixed with water. If, as Orfila remarks, the individual cannot vomit, either from some peculiar organization or from lockjaw, then the stomach-pump must be used, and the tube, either inserted through the mouth or nares.

If there is still much pain and symptoms of gastritis, or peritonitis, after the vomiting has ceased, or partially so, we must have recourse to local and general bleeding. Decoction of linseed, with opium, forms a very excellent enema, and proves exceedingly useful. The warm bath, semicupium and pediluvium ought to be used, as also fomenting the abdomen well, if the patient can bear it.

Second.—The treatment of mercurial erethysm consists in mild nourishing diet, pure air, yet not too keen; gentle relaxation of the bowels: sometimes the ascetate of lead has been used, in small doses, for the purpose of stopping salivation, as also tartar emetic, with very good effect.

MORBID APPEARANCES.

The appearances which are presented by the action of the mercurials are very similar to those already described under general irritants and arsenic; but there is generally a greater degree of inflammation, ulceration, and destruction of the tissues of the alimentary canal; the mouth, fauces, and œsophagus suffer severely; there is great extravasation of blood in the mucous membrane of the stomach, forming large black patches, which are at times much ulcerated, and occasionally perforated. There is another peculiarity which the salts of mercury possess, and which sometimes very materially assist us in our investigations. When corrosive poison has been taken, that part of the stomach where the corrosive first attacks is generally ulcerated; the ulcer is either covered by a slough (in which a portion of the poison will frequently be detected), or the slough having been thrown off, the aperture is surrounded with a pink or rose colored margin, the parts of the stomach adjoining having the same color, its external coat frequently discolored, its peritoneal one inflamed and much projected. The urinary organs generally present signs of inflammation.

TESTS.

For Calomel.—It is a white insoluble substance. Added to lime-water, a black precipitate is thrown down.

Calomel is composed of—

Chlorine	1 Eqt..	36	236, or 1 Eqt. of protochloride of mercury, or calomel.
Mercury	1 Eqt..	200	
Calcium	1 Eqt..	20	28, or 1 Eqt. of lime.
Oxygen	1 Eqt..	8	

The 36, or 1 equivalent of chlorine, unites with the 20, or 1 equivalent of calcium, forming 56, or 1 equivalent of chloride of calcium; the 8, or 1 equivalent of oxygen, uniting with the 200, or 1 equivalent of mercury, forms 208, or 1 equivalent of the protoxide of mercury, which is precipitated.

For Corrosive Sublimate.—As this poison is one of the most accessible and most deleterious, it requires a more copious detail than the other preparations of mercury.

It is generally met with in the form of a white, heavy powder, of a strong, acrid, metallic, and peculiar disagreeable taste. Specific gravity, 5.14. It is soluble in boiling and cold water, in alcohol, and ether. We may have to detect this poison either in the solid state, in solution, or in mixed fluids.

Solid state.—In the solid state, if it be treated with a solution of potash, or lime-water, a yellow precipitate is thrown down, the protoxide of mercury. (*Vide Test* 6, *for corrosive sublimate*, for the theory of the decomposition.)

In solution.—There are nine principal tests for corrosive sublimate in solution; they are—albumen, ammonia with potash, galvanism, reduction, hydriodate of potash, lime-water, protochloride of tin, solution of potash, and sulphuretted hydrogen.

First.—Albumen.—On adding it to the solution, a white precipitate is thrown down, supposed to be a triple salt, composed of calomel, chlorine, and albumen.

Second.—Ammonia.—When ammonia, with potash, is thrown into the solution, a white precipitate falls, known by the name of the hydrargyrum precipitatum album.

Rationale.—

Potassium	1 Eqt.....	40	48, or 1 Eqt. of potash.
Oxygen	1 Eqt....	8	
Hydrogen	2 Eqt....	2	18, or 2 Eqt. of water.
Oxygen	2 Eqt....	16	
Chlorine	2 Eqt....	72	272, or 1 Eqt. of bichloride of mercury.
Mercury	1 Eqt....	200	
Nitrogen	1 Eqt....	14	17, or 1 Eqt. of ammonia.
Hydrogen	3 Eqt....	3	

The 16, or 2 equivalents of oxygen from the water, unites with the 200, or 1 equivalent of mercury, forming peroxide of mercury; the 2, or 2 equivalents of hydrogen, unites with 72, or 2 equivalents of chlorine, forming 74, or 2 equivalents of muriatic acid; 37, or 1 equivalent of muriatic acid, unites with the 48, or 1 equivalent of potash, forming 85, or 1 equivalent of muriate of potash; the 37, or remaining equivalent of muriatic acid, unites with the 216, or 1 equivalent of peroxide of mercury, and 17, or 1 equivalent of ammonia, forming 270, or 1 equivalent of hydrargyrum precipitatum album: it is a white powder.

Third.—Galvanic test.—To perform this test, you place a drop of the suspected liquor on a piece of gold, as a clean sovereign; you touch the gold, through the liquid, with some dissimilar metal, as a piece of steel, or a penknife; if corrosive sublimate is present, the sovereign will be whitened where the steel came in contact with the gold. It is owing to an amalgam of mercury and gold being formed. The *Rationale* of it is this. The water becomes decomposed, the oxygen goes to the steel, oxidizing it; the hydrogen proceeds to the chlorine, forming muriatic acid, which escapes, the mercury amalgamating with the gold. When the gold is heated above 600 degrees, the mercury is driven off in the form of vapour.

Fourth.—Reduction.—To perform this test, a portion of the solution is to be evaporated to dryness, the residue mixed with black flux, and heated in a glass tube. The chlorine of the corrosive sublimate unites with the potassium, forming chloride of potassium, the oxygen of the potash, at its moment of liberty, uniting with some carbon of the flux, forms carbonic acid; the mercury rises in vapour, and is condensed in the cooler part of the apparatus, in its metallic form.

Fifth.—Hydriodate of potash.—On adding this salt to the solution, a beautiful bright scarlet precipitate is thrown down, the biniodide of mercury.

Rationale.—Two equivalents of the hydriodate of potash are required.

Potassium	2 Eqt..	80	96, or 2 Eqts. of potash.	350, or 1 Eqt. of hydriodate of potash.
Oxygen	2 Eqt..	16		
Iodine	2 Eqt..	252	254, or 2 Eqts. of hydriodic acid.	
Hydrogen	2 Eqt..	2		

Chlorine	2 Eqt..	72	272, or 1 Eqt. of bichloride of mercury.
Mercury	1 Eqt..	200	

The 2, or 2 equivalents of hydrogen, from the hydriodic acid, unites with the 72, or 2 equivalents of chlorine, from the bichloride, forming 74, or 2 equivalents of muriatic acid, which unites with the 96, or 2 equivalents of potash, 170, or 2 equivalents of muriate of potash resulting. The 252, or 2 equivalents of iodine, uniting with the 200, or 1 equivalent of mercury, forming 452, or 1 equivalent of biniodide of mercury, which subsides.

Sixth.—Lime-water throws down an orange yellow precipitate, known as the yellow-wash, or peroxide of mercury. There are two ways of describing its decomposition.

1*st.*—Two equivalents of lime are requisite to form this test.

Calcium	2 Eqt..	40	56, or 2 Eqt. of lime.
Oxygen	2 Eqt..	16	

Chlorine	2 Eqt..	72	272, or 2 Eqt. of bichloride of mercury.
Mercury	1 Eqt..	200	

Rationale.—The 72, or 2 equivalents of chlorines, unites with the 40, or 2 equivalents of calcium, forming 112, or 2 equivalents of chloride of calcium, which is retained in solution; the 16, or 2 equivalents of oxygen, uniting with the 200, or 1 equivalent of mercury, 216, or 1 equivalent of peroxide of mercury is thrown down.

2*nd.*—Some persons suppose that the peroxide of mercury obtains its oxygen from the decomposition of the water, instead of from the lime; the hydrogen of the water, uniting with the chlorine, forming muriatic acid, which unites with the lime, a muriate of that compound resulting, which remains in solution, the peroxide of mercury being precipitated.

Seventh.—Protochloride of tin throws down a greyish black precipitate of metallic mercury, in minute divisions, a soluble bichloride of tin being formed, which remains in solution.

To perform this test two equivalents of the protochloride of tin are required.

$$\left.\begin{array}{lll}\text{Tin} & \text{2 Eqt..} & 116 \\ \text{Chlorine} & \text{2 Eqt..} & 72\end{array}\right\}\text{188, or 2 Eqt. protochloride of tin.}$$

$$\left.\begin{array}{lll}\text{Chlorine} & \text{2 Eqt..} & 72 \\ \text{Mercury} & \text{1 Eqt..} & 200\end{array}\right\}\text{272, or 1 Eqt. bichloride of mercury.}$$

Rationale.—The 188, or 2 equivalents of protochloride of tin, takes the 72, or 2 equivalents of chlorine, from the bichloride of mercury, forming 260, or 2 equivalents of bichloride of tin, which remains in solution; the mercury falls down in the metallic state. Care must be taken not to add the protochloride of tin in too small a quantity, for, in that case, only 1 equivalent of chlorine will be abstracted from the corrosive sublimate, and the mercury, with its other equivalent, falls down as the protochloride of mercury or calomel.

Eighth.—Potash in solution throws down a yellow precipitate; the decomposition is similar to that of lime water.—(*Vide the sixth test for corrosive sublimate.*)

Ninth.—Sulphuretted hydrogen throws down a brownish black precipitate.

Two equivalents of sulphuretted hydrogen are requisite for this test. The 2 equivalents of hydrogen unite with the 2 equivalents of chlorine, forming 2 equivalents of muriatic acid; the 2 equivalents of sulphur unite with the mercury, forming 1 equivalent of the bisulphuret, which falls down.

For corrosive sublimate in a state of mixture.—This is by far the most difficult process, as this substance is easily decomposed by many vegetable and animal products, as albumen, casein, gluten, osmazome, gelatine, &c. &c.

The suspected liquid is first to be mixed with ether (which is an excellent solvent for this substance), then well shaken ; lastly, set aside to allow the etherial solution of the salt to rise to the surface ; this is to be carefully removed and evaporated to dryness, the residuum is to be mixed with boiling water, which forms a solution, and may be tested by the appropriate re-agents for corrosive sublimate in solution.

There is another very delicate test, mentioned by Dr. Christison, in his excellent work on poisons. It consists in adding protochloride of tin to the solution ; the mercury is thrown down as a black powder.—(*Vide Test* 7, *for solution.)*

This precipitate is to be collected, washed, and drained on a filter ; it is then to be boiled in a glass flask, with a moderate strong solution of caustic potash, until the appearance of animal or vegetable matter is no longer visible ; next allow it to simmer gently, that the fatty matter, as it rises to the surface, may be removed ; next pour off the fluid, wash the precipitate with water, then let it subside. Place the powder in a glass tube, heat and sublime it.

BISULPHATE OF MERCURY, 232; OR VERMILLION.

Sulphur	2 Eqt...	32	232.
Mercury	1 Eqt...	200	

It is commonly met with in shops as a beautiful red heavy powder. When heated in a tube, it volatizes without change; when heated with potash, it becomes decomposed, metallic mercury being obtained. To explain the nature of the changes that ensue, it is necessary to take four equivalents of the bisulphuret and eight equivalents of potash.

Potassium	8 Eqt..	320	384, or 8 Eqt. of potash.
Oxygen	8 Eqt..	64	
Sulphur	8 Eqt..	128	928, or 4 Eqt. bisulphuret of mercury.
Mercury	4 Eqt..	800	

Rationale.—Six portions of the oxygen unite with two of the sulphur, forming 80, or 2 equivalents of sulphuric acid, and the remaining 2 equivalents of oxygen unite with the 2 equivalents of potassium, forming 96, or 2 equivalents of potash; this unites with the sulphuric acid, forming 176, or 2 equivalents of sulphate of potash.

The 6 remaining equivalents of potassium unite with the remaining 6 of sulphur, forming 336, or 6 equivalents of sulphuret of potassium, 4 equivalents of metallic mercury being set free.

SUB-BISULPHATE OF MERCURY, 984; OR, TURPETH MINERAL.

Sulphuric Acid	3 Eqt.	120	984.
Peroxide of Mercury	....	864	

When the bisulphate of mercury is thrown into boiling water, a bright brownish yellow powder subsides, which Mr. Phillips supposes to be constituted of three equivalents of sulphuric acid and four of the peroxide of mercury.

TEST.

Add this powder to a solution of pure potash, the peroxide of mercury is precipitated, and sulphate of potash remains in solution.

PEROXIDE OF MERCURY, 216; OR, RED PRECIPITATE.

Oxygen	2 Eqt.	16	216.
Mercury	1 Eqt.	200	

Peroxide of mercury is generally in the form of red or orange colored shining crystalline scales, it is slightly soluble in water, giving to it an acrid metallic taste.

TEST.

By the aid of heat, it is resolved into metallic mercury and oxygen gas.

BICYANIDE OF MERCURY, 252.

$$\left.\begin{array}{lll}\text{Cyanogen} & 2\text{ Eqt..} & 52\\ \text{Mercury} & 1\text{ Eqt..} & 200\end{array}\right\}252.$$

Is colorless, inodorous, and opaque, with a strong disagreeable metallic taste.

TEST.

Place a small quantity in a glass tube, sealed at one end; the open end is then to be drawn off to a small aperture; the cyanide must then be heated in a spirit lamp; the mercury sublimes, and condenses in the metallic state; the cyanogen passes out at the small aperture, which, on the application of flame, burns with a peculiar reddish purple color.

NITRATES OF MERCURY.

There are two nitrates of mercury, the protonitrate and pernitrate.

The *protonitrate* exists in the form of transparent, colorless crystals, when these are heated, the salts become decomposed, nitrous fumes fly off, and the peroxide remains. Hydriodate of potash precipitates it yellow.

Pernitrate of Mercury.—The crystals have generally a yellowish white colour; they are decomposed by heat, like the protonitrate; but it is precipitated a bright red by hydriodate of potash.

NITRATE OF SILVER, 170; OR, LUNAR CAUSTIC.

SILVER occurs either native, or in combination with antimony, arsenic, sulphur, lead, &c.

It has a beautiful white metallic lustre, and great malleability, ductility, and tenacity.

Nitrate of silver is formed by the action of nitric acid on this metal, a portion of the oxygen from the nitric acid oxydizing the silver, which then unites with some undecomposed nitric acid, forming nitrate of the peroxide of silver, and nitrous gas flies off.

When pure, it is colorless and transparent; but that which is generally met with, is dark colored; it is soluble in its own weight of cold, and half its weight of warm water.

SYMPTOMS.

There is excruciating burning pain in the mouth, œsophagus, and stomach; if the solution is strong, blacking of the lips, chin, and mouth, and wherever else the corrosive touches; great difficulty of swallowing, intense thirst, with all the other symptoms of corrosive poisoning.

TREATMENT.

We have an excellent antidote for nitrate of silver, in muriate of soda or common salt, the nitrate being decomposed, and an inert chloride formed.—(*Vide Test for Nitrate of Silver.*)

This remedy cannot be too quickly applied, as the fatal energy of lunar caustic on the soft intestinal tunics admits of no delay. It should be mixed with water as an ounce to a pint, and copious draughts given; the poison is soon neutralized, vomiting may occur from using the salt water, which may prove useful. Soft, demulcent drinks must afterwards be given, to soothe the irritated and abraded surfaces. When inflammation of any of the viscera ensues, local and general bleeding must be adopted; and we must also have recourse to emollient fomentation, warm baths, anodyne clysters, &c.

MORBID APPEARANCES.

The morbid appearances are the same as those generally met with under corrosive and irritant poisons: redness, inflammation, ulceration, gangrene, and sphacelus of one or more parts of the canal, where the energy of the poison has had time to act. If the dose was strong, the stomach sometimes resembles boiled meat; if the nitrate of silver was taken in the solid state, several eschars of a greyish white or deep black color are found.

TESTS.

We may have to test it in the solid or liquid states.—

In the solid state.—First.—In this state, when heat is applied, the salt becomes decomposed, the gas flying off, leaving pure silver.

Second.—Take the lunar caustic, add distilled water to it, and then use the liquid tests.

In a state of solution.—First.—When muriate of soda or common salt is added, the nitrate becomes decomposed, and chloride of silver is precipitated, which, on exposure to the light, turns brownish black.

Rationale.—In this case there is an instance of double elective affinity. The muriatic acid leaves the soda and unites with the silver in preference, but the salt formed by their union, being insoluble, falls down as a white precipitate, the nitrate of soda remaining in solution.

Second.—Nitrate of silver in solution stains paper and all animal tissues black; this is owing to its becoming decomposed; the nitric acid acts upon the skin, &c., yielding a portion of its oxygen, and nitrous acid flies off, the oxide of silver remaining, which immediately acquires the characteristic brownish black color of the protoxide.

Third.—To a solution of lunar caustic, add ammonia, till the precipitate at first thrown down is nearly all redissolved; then add a few drops to a solution containing arsenic; a yellow powder will immediately be precipitated, the arsenite of silver.—(*Vide Ammoniacal nitrate of silver test for arsenic in solution.*)

MURIATE OF TIN, 102.

$$\left.\begin{array}{l}\text{Muriatic acid 1 Eqt. } \ldots.37\\ \text{Oxide of tin \ \ 1 Eqt. } \ldots.65\end{array}\right\}102.$$

TIN has some resemblance to silver, but it is not so white; it is not easily acted on by the air at ordinary temperature. It has great malleability, but little tenacity and ductility. It emits a peculiar noise on being bent backwards and forwards. Specific gravity, 7.521. It enters into combination with oxygen and chlorine, &c.

Muriate of tin.—There are two; the protochloride and bichloride.

Protochloride.—It is a greyish white substance, resinous lustre; heated in chlorine, it is resolved into the bichloride.

Bichloride is a colorless volatile liquid; on exposure to the air, dense white fumes rise.

The muriates are very poisonous; they are used in the arts of color making and dyeing.

SYMPTOMS.

Orfila describes the symptoms of poisoning with muriate of tin as follows:—An austere, metallic, intolerable taste; a sensation of constriction in the throat, nausea, repeated vomiting, a sharp pain in the epigastric region, which in a short time extends to all the other regions of the abdomen; copious evacuations of the bowels; slight difficulty of breathing; pulse small, light, and frequent; convulsive motions of the muscles of the extremities, and of the face; sometimes paralysis; these symptoms are mostly followed by death.

TREATMENT.

Milk having the property of decomposing the muriate of tin, Orfila instituted a series of experiments, and found that if it was given in large quantities, shortly after the poison had been administered, the baneful effects of the muriate were destroyed.

If milk is not very accessible, then warm water, or copious draughts of bland mucilaginous fluids, the energy of the poison becomes diluted by so much liquid, and is brought off the stomach, the quantity of fluid acting as an emetic. Inflammation must be treated by the lancet, leeches, fomentation, and anodyne clysters.

MORBID APPEARANCES.

The morbid appearances resemble those of the other corrosive irritants already described. There is redness of the stomach and small intestines, black spots and patches of extravasated blood, the mucous membrane hardened and ulcerated in places, the villous coat generally much tanned, the lungs contracted.

TESTS.

Protochloride of tin.—First.—When this salt is added to a solution, containing bichloride of mercury, the mercurial salt is decomposed, and metallic mercury is precipitated, the resulting bichloride of tin remaining in solution.

Rationale.—*Vide* test 7, for corrosive sublimate.

Second.—When the protochloride is added to an aqueous solution of gold, a purple precipitate falls, known by the name of the purple of cassius. *Rationale* not well understood. *Turner's Chemistry*, p. 610.

Third.—Heated with black flux, it becomes reduced to the metallic state.

Fourth.—When a few drops of protomuriate of tin are thrown into milk, it directly becomes coagulated; the coagulum, when washed and dried, is of a yellow color, brittle, and has the appearance and odour of dried cheese.

When the curds are heated with potash, the carbon takes the oxygen from the oxide of tin, forming carbonic acid, and metallic tin remains in the crucible. The metallic tin obtained in this way has a yellowish white appearance; but sometimes it may be in such small quantities as not to be easily distinguished. In that case the mass must then be treated with aqua regia, or nitro-muriatic acid; the chlorine of the acid uniting with the tin, forms a protochloride of that metal, the hydrogen takes one equivalent of oxygen from the nitric acid, forming water; and nitrous fumes escape; the protochloride must now be dissolved in distilled water, and tested with some of the above re-agents.

Fifth.—With sulphuric acid, it throws down a milky white precipitate, which is sulphur.

Bichloride of tin is distinguished from the protochloride by not being acted upon by sulphuric acid and deuto-muriate of gold. It is obtained in the metallic form when heated in a crucible with black flux.

ZINC, 32.

The zinc of commerce is obtained from the native carbonate and sulphuret; the sulphuret is first washed, so that the metal may become oxidized; it is then heated with carbonaceous matters, and distilled; this must be repeated to obtain it pure.

It has a strong metallic lustre, lamellated texture, bluish white color, very hard, and specific gravity 7.

Between 210 and 300 deg. F. it is both malleable and ductile. When heated to 941 deg. F.

in the open air, it bursts into violent ignition, carrying up the oxide, and forms what is called philosophers' wool, or flowers of zinc.

The sulphate of zinc, or white vitriol, is the most active and most important preparation of this metal. It is formed by the action of dilute sulphuric acid on zinc.

Rationale.—Zinc has a great affinity or prediliction for oxygen; but when it is thrown into water, its outer surface soon becomes covered with a coating of the oxide, and the process of oxidization would be stopped, were it not for the addition of the sulphuric acid, which takes it up as fast as it is formed, a sulphate of the protoxide of zinc resulting; the zinc obtains its oxygen from the water, the hydrogen evolved, escaping into the air in the form of gas. That which is used in commerce is rarely pure, generally containing sulphate of iron and copper; it is obtained in granular masses, has a strong, acrid, styptic taste, and is very soluble in water.

SYMPTOMS.

An acrid astringent taste in the mouth, constriction of the throat, pain in the epigastric region, nausea, vomiting, diarrhœa, cold and clammy perspiration, coldness of the extremities, paleness of the countenance, dulness of the eyes, and the pulse varying.

TREATMENT.

As sulphate of zinc has such powerful emetic properties, we must endeavour to ease and alleviate the straining, by giving copious draughts of milk, mucilaginous fluids, warm water, &c.; after the vomiting has continued some time, and you are led to believe the whole of the poison has been evacuated, and great nervous irritation being still present, then you must administer some opiates, as half a drachm of tincture of opium, in two table spoonsful of camphor mixture; emollient and anodyne clysters must be likewise administered. If these symptoms still remain alarming, and you fear inflammation has already commenced, then you must use general and local bleeding, and a strict antiphlogistic plan of treatment must be adopted. It is very rare that any fatal or unpleasant symptoms follow the administration of this poison, its own powerful emetic properties evacuating it before it has had time to do any very serious injury.

MORBID APPEARANCES.

The morbid appearances are very slight; a little extravasated blood, between the coats of the stomach, and some slight blush of inflammation. It seems, when it causes death, to have a powerful action on some remote vital organ.

When injected into a vein, Orfila found that forty-eight grains killed a small dog almost instantly, while to another he gave internally sixty grains, which had no other effect than causing it to vomit.

TESTS.

First.—Chromate of potash throws down an orange red precipitate, the chromate of zinc. The potash uniting with the acid, remains in solution.

Second.—Sulphuretted hydrogen throws down a white precipitate, the sulphuret of zinc; the oxygen of the zinc, uniting with hydrogen of the sulphuret, forms water.

Third.—Ferrocyanate of potash throws down a white precipitate, the ferrocyanate of zinc.

Fourth.—It is precipitated from its solutions, as the white oxide, by pure potash and ammonia.

ASTRINGENTS.

By astringent poisons, we mean those substances which, by their action on the solids, render them denser, thereby compressing the nervous fibrillæ to such an extent, that their sensibility is destroyed, and death follows. The most important and common is lead, and its preparations.

LEAD, 104.

Lead is a simple elementary body; it has a metallic bluish white lustre; is soft, and easily cut or bent, and is very malleable: specific gravity 11.381; fuses at 612 F.

There are several preparations of lead.

First.—Acetate, or sugar of lead.

Second.—Protoxide, litharge, or red lead.

Third.—Carbonate, ceruss, or white lead.

SYMPTOMS.

Occasional burning and pricking sensation in the throat; nausea; vomiting; pains round the navel, generally eased by pressure; violent constipation of the bowels; convulsions; vomiting of blood and fœcula; great depression of the vital powers, and death. If the dose has not been very large, palsy of the hands and feet may ensue; sometimes followed by apoplexy.

Those individuals who are in the habit of working in lead mines, also plumbers, glaziers, &c. are frequently attacked with a disease called painters' colic, the most prominent features of which are, a twisting pain about the navel, relieved on pressure; obstinate constipation of the bowels, and vomiting.

TREATMENT.

If the bowels can be freely acted upon, the patient has a good chance of recovery, and it must be our duty to attend especially to that point. The best treatment is to give a good dose of sulphate of magnesia, in an hour six grains of calomel, and one of opium. If the colic and obstruction have proceeded from a spasmodic contraction of the bowels, the opium will generally relax it; the patient must have a warm bath, and warm injections, made with decoction of barley, one pint; tincture of opium, ʒij.

If this has not the power of relaxing the bowels, he may be bled to sixteen ounces in a warm bath; if this treatment fails, we may then suppose it is owing to an atonic state of the bowels. Some croton oil, or gamboge, must be administered; but the first plan of treatment I have seen adopted with the best results, and I, therefore, should rely most upon it.

When palsy of the hands is the only bad symptom remaining, he must be careful as to his diet; it must be light and nourishing; he must have his hands supported in slings, and have them well rubbed, or electrified; he should be in the air, and take gentle exercise; but, especially, not to return to his work till perfectly recovered. Those who have been once attacked with this disease, are liable to its recurrence; therefore, they should pay great attention to have their bowels well regulated.

MORBID APPEARANCES.

The morbid appearances vary according to the quantity and strength of the poison; carbonate of lead produces in some, inflammation and irritation of the stomach, gullet, and intestines; the parts being red, and gorged with blood, or blanched. Orfila supposes it to be owing to some peculiar chemical action of the poison. The stomach sometimes contains a quantity of brownish or reddish black matter, in which traces of the poison may be found.

In other cases, the mucous membrane of the alimentary canal is healthy to all appearances; but the colon is contracted in one part, and dilated in another.

In other cases, no morbid appearances whatever are found.

The paralyzed limbs are very pale, the blood sometimes not coagulated.

TESTS FOR THE PREPARATIONS OF LEAD.

Acetate of lead is generally met with, either as a white heavy powder, or in masses of crystals of six-sided prisms; has a sweet taste, followed by an astringent one; is soluble in four times its weight of water, at 60 F. There are five principal tests for the acetate of lead; *first*, reduction; *second*, sulphuretted hydrogen; *third*, chromate of potash; *fourth*, hydriodate of potash; *fifth*, metallic zinc.

First test.—Reduction.—Heat the acetate, a portion of its acid is driven off, recognizable by the odour; another portion is decomposed, and serves as a flux for the reduction of the oxide of lead to the metallic form.

Second.—Sulphuretted hydrogen throws down a black precipitate, and is a test of very great delicacy, the hydrogen uniting with the oxygen of the lead, forming water; the sulphur uniting with the lead, forms a sulphuret of that metal.

Third.—Chromate of potash throws down a beautiful yellow precipitate, the chromate of lead; the acetic acid passing by double elective affinity to the potash, a soluble acetate of potash resulting; the chromic acid uniting with the lead, an insoluble chromate of lead falls down.

Fourth.—Hydriodate of potash throws down a bright yellow precipitate, the iodide of lead.

Fifth.—When a piece of zinc is immersed into a vessel containing lead in solution, even the twentieth part only of a grain in 20,000 parts of water was detected by Christison; the lead becomes displaced by simple elective affinity, and falls down, while the zinc is dissolved by the acid, and held in solution.

PROTOXIDE AND DEUTOXIDE.

The first has a reddish brown color, the other a bright red; their color and appearance is a very good test; they are turned black by sulphuretted hydrogen, and with charcoal are reduced to the metallic state; the tests for the acetate hold good here.

CARBONATE OF LEAD

Is met with in the form of a white heavy powder; heated with charcoal it becomes decomposed, the carbonic acid flying off, and metallic lead remaining.

ACRIDS.

By acridity we mean those substances which have a sharp, pungent taste, followed by a sensation of heat; when applied to the skin or mucous membrane, they irritate, inflame, and ulcerate those parts.

The gases are the first substances in this division that we shall have to examine; but some of them have narcotic properties, and therefore they ought not properly to be placed here; but I think it will be better to describe them now, than to separate them, and place one half in another part of the work.

The acrid gases are ammonia, bromine, chlorine, iodine, and muriatic acid gas.

The narcotic gases are carbonic acid, cyanogen, carburetted hydrogen, and sulphuretted hydrogen.

AMMONIA, 17.

$$\left.\begin{array}{lll}\text{Nitrogen} & \text{1 Eqt.} \ldots\ldots & 14\\ \text{Hydrogen} & \text{3 Eqt.} \ldots\ldots & 3\end{array}\right\}17.$$

This has already been described, when treating on the alkalies. (*Vide* page 47.)

BROMINE, 75,

Is obtained from bittern, where it exists as a hydrobromate of potash, or soda; chlorine is first passed through the solution; it sets the bromine free, taking its place; the solution must now be heated to the boiling point, when the bromine, passing over into receivers, surrounded with ice, is condensed. It has a brownish color; it is very poisonous; one or two drops placed on the bill of a bird, kills it immediately. It is rarely seen except in the laboratory, and is very unimportant.

CHLORINE, 36.

Is obtained by heating muriatic acid and peroxide of manganese; the hydrogen of the acid uniting with some oxygen, from the peroxide of manganese, forms water, and chlorine passes over. It has a greenish color; some metals placed in it, minutely divided, burst into ignition, a chloride of the metal being formed. It is a very irritating substance when inhaled, producing inflammation of the air passages.

IODINE, 125.

Is obtained from kelp, or incinerated sea weed in which it exists as hydriodate of potash and soda.

This is treated with sulphuric acid and peroxide of manganese.

Rationale.—The sulphuric acid unites with the soda, potash, and protoxide of manganese, forming sulphates of those substances; a portion of the oxygen, from the peroxide of manganese, unites with the hydrogen, forming water; and the iodine is expelled by the application of heat, and condenses in receivers kept cool; it is solid, of a greyish black color, metallic lustre, and scaly; on the application of heat, it rises in beautiful violet colored vapours.

SYMPTOMS.

Sense of constriction of the throat, nausea, pain in the stomach, vomiting of a yellowish matter, giddiness, and great paleness of the countenance.

It is very rare that any serious accident arises from this substance.

TESTS.

When pure Iodine is passed into a cold solution of starch, a beautiful blue color is formed; this test is so delicate, that in a solution containing only 1,450,000 of its weight of iodine, the blue color is formed. Iodine is also known by the beautiful violet color of its vapour.

HYDRO-CHLORIC ACID GAS, 37,

$$\left.\begin{array}{llr}\text{Chlorine} & 1\ \text{Eqt. .....} & 36\\ \text{Hydrogen} & 1\ \text{Eqt. ....} & 1\end{array}\right\}37.$$

Has similar irritating effects as chlorine.

The narcotic gases are—

CARBONIC ACID, 22.

$$\left.\begin{array}{llr}\text{Carbon} & 1\ \text{Eqt. ....} & 6\\ \text{Oxygen} & 2\ \text{Eqt. ....} & 16\end{array}\right\}22.$$

This is one of the most important of the gases. It exists so very abundantly in many substances, and is so easily decomposed from its salts and combinations, that accidents are continually occurring from it. In brewhouses it is very common, owing to the fermentation of the beer; burning fuel, coals, charcoal, &c. give it out very abundantly. In many caves, mines, sewers, coal pits,

&c. it is often met with, and most serious accidents have occurred from the incautious entrance of individuals into them.

It is obtained for investigation by treating carbonate of lime with muriatic acid, a chloride of calcium being formed, and the carbonic acid escaping, is collected in proper receivers.

It is colorless and inodorous, requiring a pressure of 30 atmospheres to condense it into a liquid. Specific gravity 1.524.

SYMPTOMS.

In poisoning by this gas, some persons are attacked with convulsions, and giddiness; others fall down immediately insensible. Some persons suppose that death ensues from the obnoxious principle of the gas, others believe it to be owing to a want of atmospheric air, and that the gas is innocuous.

TREATMENT.

As there is generally great oppression of the brain, and stagnation of the arterial system, we must alleviate this as soon as possible; the patient must be bled to ten or twelve ounces; if an electrical or galvanic machine is at hand, he must be electrified; if it is not easy to be procured, then the chest and body must be rubbed with vinegar, ammonia, or salt and water; cold water must frequently be dashed over the body; using the cupping glasses to the temples, or neck, may be very useful; the inflation of the lungs with oxygen gas may also prove serviceable.

MORBID APPEARANCES.

The viscera are generally gorged with black fluid blood, especially the brain; the tongue is protruded and dark, the eyes prominent, and the large vessels and heart filled with black fluid blood.

TESTS.

When this gas comes in contact with lime water, the lime is thrown down as an insoluble carbonate. It reddens litmus paper; but by the application of heat, the paper resumes its natural color.

CYANOGEN, 26.

Carbon	2 Eqt.	12	26.
Nitrogen	1 Eqt.	14	

Cyanogen gas is obtained by heating in a glass tube the bicyanuret of mercury. It is a colorless gas, and burns with a beautiful purple flame;

has a strong pungent odour. Under the pressure of 3.6 atmospheres, the thermometer standing at 45 deg. F., it is condensed into the liquid state.

There is no case on record of poisoning with this gas, but its deleterious properties have been proved on animals, killing them very speedily.

SULPHURETTED HYDROGEN, 17.

$$\left.\begin{array}{lll}\text{Sulphur} & \text{1 Eqt. ....} & 16 \\ \text{Hydrogen} & \text{1 Eqt. ....} & 1\end{array}\right\} 17.$$

It may be obtained for experiment by heating the sulphuret of antimony with muriatic acid; the hydrogen of the acid unites with the sulphur, and flies off in vapour; the chlorine unites with the antimony, forming a chloride of that metal.

It is a colorless gas, with the peculiarly offensive odour of putrifying eggs. It is inflammable, and is very injurious to animal life.

SYMPTOMS.

Some persons who have respired it fall down immediately insensible; others have spasms and convulsions preceding the state of insensibility, with great difficulty of breathing.

TREATMENT.

The same as for carbonic acid.

MORBID APPEARANCES.

The head is generally found gorged with blood; the blood is frequently black and fluid; the lungs are gorged with it; the bronchial tubes slightly reddened; the viscera has the odour of decayed fish.

CARBURETTED HYDROGEN, 8,

$$\left.\begin{array}{lll}\text{Carbon} & 1\ \text{Eqt.}\ \ldots\ldots & 6\\ \text{Hydrogen} & 2\ \text{Eqt.}\ \ldots\ldots & 2\end{array}\right\}8.$$

Is best obtained, for experimenting on its nature, by stirring up the mud in stagnant pools, where it is generated in great abundance, from the decaying vegetable matter.

It is colorless, nearly inodorous, and tasteless; it is very inflammable—burns with a yellow flame.

SYMPTOMS AND TREATMENT.

The same as sulphuretted hydrogen.

THE VEGETABLE ACRIDS.

In treating of the vegetable acrids, a general description will suffice, as they all act very similarly. We will, therefore, first take the symptoms, next the morbid appearances, and lastly, the name, class, and order of all the most important plants, the places from which they are obtained, and in what part the active principle resides.

SYMPTOMS.

The symptoms will be much modified by the quantity taken; there is generally a sense of heat in the throat, nausea, vomiting, a short twisting pain, commencing in the epigastric region, and gradually extending itself over the abdomen, which becomes very painful, and cannot bear the least pressure; a profuse diarrhœa follows the result of inflammation of the alimentary canal; great debility, syncope, convulsions, delirium, and death.

TREATMENT.

The best plan of treatment is to empty the stomach of its contents as soon as possible, and this may either be accomplished by means of the stomach-pump or an emetic; either the sulphate of zinc or the antimonii tartarizali; after the stomach has been emptied, mild diluent liquids are to be given, as linseed tea, barley water; and if the pain is very acute, with a quick throbbing pulse, he had better lose a little blood; one grain of opium, with three of calomel, will likewise be beneficial; if the pain and inflammation still continue, leeches on the abdomen will be required, and emollient enemas ought also to be used. It is very rare that the case terminates fatally.

MORBID APPEARANCES.

When a total termination occurs, the usual appearances are those of inflammation; the stomach and alimentary canal are red or black, in some parts ulcerated. If death has quickly supervened, some portion of the plant is occasionally found in the intestines.

ACONITUM NAPELLUS.

Class, *polyandria*. Order, *trigynia*. Natural order, *ranunculaciæ*. Obtained from the mountainous parts of Germany. It is also found, in this country, in pleasure grounds. Its active principle exists in an alkaloid base obtained from the leaves and root, called aconita.

SYMPTOMS.

There is an acrid taste, followed by a burning heat of the tongue, gums, and cheeks, which swell; nausea, occasional vomiting, giddiness, delirium, and convulsions; there is great irregularity in the pulse, sometimes imperceptible; this is followed with syncope, lethargy, and death; all the aconites act in a similar manner.

TREATMENT.

The treatment is the same as that laid down for narcotic acrid poisons.

MORBID APPEARANCES.

Slight inflammation of the alimentary canal; blood, black and fluid.

ÆNANTHE CROCATA.

Class, *pentandria*. Order, *digynia*. Natural order, *umbellatæ*. The active principle resides in a milky fluid, extracted from the stem and root *Indigenous*.

SYMPTOMS.

Heat in the mouth, throat, and stomach; giddiness, delirium, convulsions, and lethargy. It is a very active poison; death generally taking place in three or four hours.

TREATMENT.

Emetics or the stomach-pump must be used, after this, oleaginous and mucilaginous fluids may be given, they soothe the irritated coats of the stomach.

ANEMONE PULSATILLA.

Class, *polyandria.* Order, *polygynia.* Natural order, *ranunculaciæ.* *Indiginous.*

SYMPTOMS.

In the powdered state, it irritates the eyes, causing violent itching; taken internally, produces irritation, colic, nausea, and vomiting.

ARUM MACULATUM.

Class, *polyandria.* Order, *monœcia.* Natural order, *callaccæ.* *Indiginous.*

SYMPTOMS.

All the plants in this class are more or less poisonous; they act like the other acrids, producing a local irritation and a secondary action on the nervous system; convulsions, vomiting, delirium, stupor, are the general effects of taking this poison.

CLEMATIS.

Class, *polyandria.* Order, *polygynia.* Natural order, *ranunculaciæ.* *Indiginous.*

SYMPTOMS.

The plants included in this class are very acrid, and when taken internally, produce severe irritation and inflammation; externally, causing redness, pustules, and excoriations when applied to the skin.

TREATMENT.

Emetics, followed by a soothing and demulcent plan of treatment.

COLCHICUM AUTUMNALE.

MEADOW SAFFRON.

Class, *hexandria.* Order, *trigynia.* Natural order, *colchicaceæ. Indiginous.* Its active principle is obtained from the bulb and seeds, and is called veratrine. A similar base is obtained from the *veratrum album* belonging to the same natural order. The seasons seem to have a peculiar effect upon the bulbs; it is least noxious in June, more poisonous in spring and autumn.

SYMPTOMS.

Heat in the mouth and throat, nausea, vomiting, violent pain in the stomach, bilious evacuations, cramps, giddiness, dimness of sight, occasional dilatation of the pupil, delirium, convulsions and stupor.

TREATMENT.

Same as for general poisoning with the narcotic acrids.

MORBID APPEARANCES.

Occasional patches of inflammation are discovered in the course of the alimentary canal.

CONVOLVULUS JALAPA AND SCAMMONIA.

Class, *pentandria*. Order, *monogynia*. Natural order, *convolvulaceæ*. The scammony is obtained from Syria, the jalap from Mexico; they both owe their active principle to a peculiar resinous matter obtained from the roots of the scammony and tubers of the jalap.

SYMPTOMS.

It produces symptoms of severe irritation, when taken in an over dose, watery alvine evacuations, severe griping pains, nausea, vomiting, and convulsions.

TREATMENT.

An emetic ought to be first given, followed up by demulcent fluids; if there is much irritation of the intestines, this mixture will prove very useful: tincture of opium, ʒj. Creta Prep. ʒj. Aqua Mucilag. ℥iv. Let a fourth part of this be taken every three hours.

CUCUMIS COLOCYNTHIDIS.

Class, *monœcia*. Order, *monadelphia*. Natural order, *cucurbitaceæ*. It is obtained from Turkey and Nubia. Its active properties reside in a resinous substance, called colocyntine, obtained from the pulp of the apple.

SYMPTOMS.

It produces watery and sanguineous evacuations, with depression of the vital powers, severe griping pains, headache, &c,

TREATMENT.

Same as for scammony.

DAPHNE MEZEREUM, OR MEZEREON.

Class, *octandria*. Order, *monagynia*. Natural order, *thymelæa*. *Indiginous*. Its action depends on an acrid principle called daphnin, obtained chiefly from the bark.

SYMPTOMS.

It acts on the mucous membrane of the alimentary canal, producing inflammation and irritation, with their peculiar symptoms, such as nausea, vomiting, diarrhœa, &c.

TREATMENT.

Same as for the convolvulus scammonia. (*Vide* page 131.)

DELPHINIUM STAPHISAGRIA.

Class, *polyandria.* Order, *trigynia.* Natural order, *ranunculaceæ.* It is obtained from the south of Europe. It owes its properties to a peculiar alkaloid base, called delphine, obtained principally from the seeds.

SYMPTOMS.

It acts by its irritating properties upon the alimentary tube, producing local inflammation, and by the sympathetic lesion of the nervous system upon the brain, there is nausea, vomiting, virtigo, and diarrhœa.

TREATMENT.

The same as for scammony. (*Vide* page 130.)

EUPHORBIA OFFICINARUM.

Class, *monœcia.* Order, *monandria.* Natural order, *euphorbiaceæ.* It is obtained from Africa.

Its properties reside in an acrid resin. We have two or three British varieties, possessing similar properties.

SYMPTOMS.

Its properties are very acrid and irritating; when applied externally, they produce considerable irritation and inflammation, and a pustular eruption; internally, violent griping pains, sanguineous stools, convulsions, delirium, stupor, and death.

TREATMENT.

Same as for scammony. (*Vide* page 130.)

MORBID APPEARANCES.

The appearances found are those resulting from inflammation.

GARCINIA, OR STALAGMITES GAMBOGIA.

GAMBOGE.

Class, *polygamia*. Order, *monœcia*. Natural order, *guttiferæ*. Obtained from Siam and Ceylon. Its properties depend upon a resinous matter gathered from the whole tree.

SYMPTOMS.

It produces nausea and vomiting, is a powerful drastic cathartic; sanguineous stools occasionally result, as well as convulsions and stupor.

TREATMENT.

Same as for scammony. (*Vide* page 130.)

HELLEBORUS NIGER AND FŒTIDUS.

Class, *polyandria*. Order, *polygynia*. Natural order, *ranunculaciæ*. They are both European plants; the latter is indiginous, their properties reside in a peculiar acrid matter.

SYMPTOMS AND TREATMENT.

Same as an over-dose of scammony. (*Vide* page 130.)

JATROPHA CURCAS.

INDIAN NUT.

Class, *monœcia*. Order, *monadelphia*. Natural order, *tithymaloides*. It is an Indian production, and possesses very energetic properties.

SYMPTOMS.

Head-ache, nausea, vomiting, griping pains in the bowels, tenesmus, or diarrhœa, convulsions vertigo, dimness of vision, syncope, great prostration of strength, death.

TREATMENT.

Same as for the scammony. (*Vide* page 130.)

MOMORDICA ELATERIUM.

Class, *monœcia*. Order, *monadelphia*. Natural order, *cucurbitaceæ*. Grows in the south of Europe. Its active principle exists in an alkaloid base, called elaterium, obtained from the pod.

SYMPTOMS

Are those of a drastic purgative. It is very irritating, producing inflammation, sometimes accompanied with sanguineous stools. If a small portion of the juice enters the eye it causes severe pain, redness, and swelling.

TREATMENT.

Same as for the scammony. (*Vide* page 130.)

OLEUM CROTONI ET RICINI.

CROTON AND CASTOR OIL.

Class, *monœcia*. Order, *monodelphia*. Natural order, *euphorbiaceæ*. The croton tiglium is obtained from the Molucca Islands, and its properties depend upon a peculiar essential oil; the *ricinus communis* comes from the East and West Indies; its properties also depend on an essential oil. Both these oils are obtained from the seeds of their respective plants.

SYMPTOMS.

The croton oil is exceedingly powerful, one grain being a full dose; it has a burning, acrid, and nauseous taste, and in over-doses acts as a very powerful irritant; the castor oil acts more mildly.

TREATMENT.

Opiates and demulcents must be used to stop the severe purging; and the lancet and leeches, if inflammation supervenes. The effects of castor oil must be treated in the same way.

RUS TOXICODENDRON,

OR POISON OAK.

Class, *pentandria*. Order, *digynia*. Natural order, *ancardiaceæ*. It grows in North America. Its active properties depend upon an acrid resin which is obtained from the leaves.

SYMPTOMS.

There is a nauseous sub-acrid taste, vomiting, convulsions, and stupor.

TREATMENT.

An emetic must be given so that the poison may be extracted as soon as possible; the after treatment consists in given cordials and stimulants if stupor, or lethargy, is likely to come on; or an antiphlogistic plan, if inflammation supervenes.

SCILLA MARITIMA.

Class, *hexandria*. Order, *monogynia*. Natural order, *asphodeliæ*. It it brought from the shores of the Mediterranean. Its active principle is called scillitin, and is obtained from the bulb. Its action is very variable.

SYMPTOMS.

It produces nausea and vomiting, accompanied with severe pain on acting on the mucous membrane; it frequently produces sanguineous stools and tenesmus; it also acts powerfully on the urinary organs, blood being mixed with the urine; and also on the lungs; convulsions are very common.

TREATMENT.

If there is much retching, a sulphate of zinc emetic will bring all the poison off the stomach; the after treatment consists in allaying the severe inflammation by bleeding, both general and topical, and by giving demulcent and mucilaginous fluids.

NARCOTICS.

By narcotics is meant those substances which have the property of stupifying the nervous system, and rendering the individual insensible to external objects.

The plants included in this division, act in a similar manner, and need no special description (except opium, which, with its preparations, requires to be separately examined); and, therefore, we shall merely enumerate their class and order, place of growth, and from what part of the plant their peculiar narcotic principle is obtained. But, before entering on this subject, a few observations must be made on some diseases which approach very nearly, in their symptoms, to poisoning by narcotics—such as apoplexy, epilepsy, and intoxication.

APOPLEXY.

Has generally some precursory symptoms, such as giddiness, ringing in the ears, &c. It generally occurs in persons advanced in life; sometimes the individual has had two or three previous fits, is of a stout habit, and has lived well; when a person is seized with an apoplectic stroke, he generally falls down instantly. With narcotics the stupor mostly comes on more gradually. In apoplexy the face is frequently bloated, pupil dilated; with opium the features are pale, and pupil mostly contracted. Apoplexy generally takes place during mealtime; narcotics act a short time after, excepting hydrocyanic acid, which shows its action very speedily. In poisoning with narcotics, the patient may be roused by calling loudly, or pinching, or injecting cold water into his ears; in apoplexy nothing affects him.

MORBID APPEARANCES.

In simple apoplexy no effusion of blood is found, but occasional slight congestion. In other cases of apoplexy the vessels are much more loaded; apoplexy may again take place from the vessels being so conjested that they ease themselves by throwing out serum, and produce what is called serous apoplexy. Another species of apoplexy is called the sanguineous, where blood is effused; sometimes this clot of blood is enclosed in a capsule, and the patient may recover. Occasionally pathologists find such a case, the individual having died from some other cause. Lastly, whenever the brain is compressed, apoplexy generally follows.

EPILEPSY.

There are, generally speaking, some warnings before an epileptic fit occurs; there is a sense as if cold water was running up the legs, sometimes a degree of chilliness or stupor. The fit comes on suddenly, with convulsions and violent contortions of the face and body; the patient is lost to all sensibility, and sometimes lies in a complete state of coma.

MORBID APPEARANCES.

Epilepsy may be occasioned either by some morbid state of the brain, as softening, abscess, &c.; or from some pressure on the brain from extraneous bodies, as tumour, hypertrophy of the bones of the cranium, or exostosis.

INTOXICATION.

There is stertorous breathing, a comatose state of the body. The breath of the patient generally has the odour of liquor, and he may be roused from this lethargy by calling loudly in his ears. Likewise collateral circumstances will much aid us in our diagnosis, as the natural temperament of the individual, the place where he was seized with the fit, the length of time it was coming on, or the appearance of any vessel containing, or having contained, liquor.

The principle narcotic poisons are the hyoscyamus, lactuca virosa, opium, and the solanums.

SYMPTOMS.

There is generally dizziness of sight, headache, stupor, and drowsiness; pale and cadaverous appearance of the countenance, the voluntary muscles lose their action, the power of deglutition becomes lost, the breathing is stertorous, the pulse small and feeble; convulsions sometimes come on, but the lethargetic state soon supervenes, and the patient lies in a comatose state.

TREATMENT.

The stomach must be evacuated as soon as possible, and therefore an emetic must be given; the sulphate of zinc is the best, as it does not produce that sense of weakness that occurs from taking tartar emetic, and acts with much greater certainty; half a drachm to two scruples ought to be given for a dose. The stomach-pump is very useful in this kind of poisoning; the stomach should be well washed out with some mucilaginous liquids; cold vinegar and water must be dashed over the head, chest, and back; after the poison is evacuated he must take some stimulants, as vinegar and water, strong tea, coffee, or ammonia. He must not be allowed to sleep, and must be kept in continual change of posture; cold water injected into the ears or nose, pinching or making slight punctures and rubbing salt in them, and every plan must be adopted to prevent the too fatal influence of sleep.

MORBID APPEARANCES.

There are very few, if any, morbid appearances discoverable; these poisons seem to act by deadening the sensibility of the nervous system. Sometimes there is a little fulness about the vessels of the head.

HYOSCYAMUS.

The hyoscyamus belongs to the class *pentandria*. Order, *monogynia*. Natural order, *solaniæ*. The narcotic poison may be extracted from the whole plant. It resides in a peculiar alkaloid principle, called hyoscyama. It is indiginous.

LACTUCA VIROSA.

The lactuca virosa and the sativa belong to the class, *syngenesia*. Order, *polygamia æqualis*. Natural order, *cicharaceæ*. It is indiginous. Its properties reside in an alkaloid base, called lactucarium, obtained from the inspissated juice of the stem and leaves.

OPIUM.

OPIUM is obtained from the *papaver somniferum*, and, indeed, from all the poppies, but not so abundantly. Class, *polyandria*. Order, *monogynia*. Natural order, *papaveraceæ*. Opium contains several peculiar principles, the most important of them are morphia, narcotine, and meconic acid, and a resinous matter.

MORPHIA, 290.

Carbon	35 Eqt.	210	290, 1 Eqt. of Morphia.
Hydrogen	18 Eqt.	18	
Nitrogen	1 Eqt.	14	
Oxygen	6 Eqt.	48	

To separate morphia from opium, a solution of the latter is made; when this is boiled with magnesia, a precipitate falls down composed of meconate of magnesia, morphia, narcotine, and a resinous matter. The precipitate is next boiled with proof spirit, which takes up the narcotine and resinous matter, the morphia and meconate of magnesia remaining; this is treated with strong alcohol, which takes up the morphia and a little of the resinous matter, from which it may be separated by frequent crystallization.

It mostly crystallizes in small white six sided prisms with ditrihedral summits, very insoluble in cold, slightly soluble in warm, but freely in boiling alcohol. It has a bitter taste, and combines with acids forming neutral salts.

SYMPTOMS.

They resemble those of opium.

TESTS.

First.—When morphia is treated with nitric acid, it turns to an orange-red, and then yellow, if too much acid has been used. These changes are not well understood, some supposing that pure morphia does not change color when nitric acid is used, but the color is owing to its impurity. It is certain some very complicated changes do take place, as by the continued action of the nitric acid it is converted into the oxalic acid. Brucia and strychnia have a similar effect with nitric acid.

Second.—When it is suspended in water, and per-muriate of iron is added, it becomes dissolved and forms a deep greenish-blue solution, which is more decidedly blue the stronger the solution and purity of the morphia.

When iodic acid is added to morphia it does not form an iodate (as is usually the case with iodic acid and the alkaloids), but decomposes it. Iodine is set free and is known by the blue color it gives to a solution of starch. According to Serullas, one grain of morphia may be detected in 7,000 grains of water; the decomposition is not known, but owing to the large quantity of hydrogen present in morphia, some of it may combine with the oxygen of the iodic acid forming water, and setting iodine free.

NARCOTINE

May be obtained by evaporating an aqueous infusion of opium to the consistence of a syrup, and then adding sulphuric ether; this takes it up, and on evaporating, deposits it in acicular crystals.

It is insoluble in cold water, slightly soluble in warm. It is more known by its negative than positive qualities. Some persons suppose the stimulating effects of opium to depend on narcotine.

MECONIC ACID.

This acid is found united in opium with morphia and narcotine, and rendering them soluble. It may be obtained in the separate state by treating a solution of opium with acetate of lead; the acetic acid unites with the morphia, forming a soluble acetate, and the meconate of lead is precipitated. The precipitate is next suspended in water, and a stream of sulphuretted hydrogen is made to pass through it, the hydrogen unites with oxygen from the lead, and water results. The sulphur unites with the lead, forming an insoluble sulphuret of lead, which falls, and the meconic acid remains in solution; this is next evaporated and crystallized. To obtain it quite pure, it requires to be redissolved several times and treated with acetate of lead; the lead separated by sulphuretted hydrogen, and the solution again evaporated and crystallized. It has a sour, followed by a bitter taste.

TESTS.

When any salt of the peroxide of iron is added to a solution containing meconic acid, it directly gives a blood-red color to the solution.

A meconate of the peroxide of iron being formed with sulphate of copper, it forms a pale green precipitate; if this is not too abundant, it will be taken up on boiling, but the precipitate will re-appear on cooling.

SYMPTOMS.

There is giddiness, headache, and stupor, sometimes vomiting and convulsions. When taken in a large dose, the patient complains of stupor, and quickly falls into a comatose state; in some, this is preceded with convulsions. The pupil of the eye is contracted in poisoning by opium, but dilated by the other narcotics; the breathing is slow and stertorous; the muscles lose their tone; deglutition is impeded; the pulse is feeble, or not perceptible; the countenance anxious or cadaverous, or bedewed with a clammy moisture. If death has not yet taken place, the patient may be roused by calling loudly, or injecting cold water into his ears or nose.

TREATMENT.

The treatment to be adopted is similar to that prescribed for general narcotic poisons. (Page 142.)

TESTS.

To detect opium in mixed fluids, the stomach and its contents are to be cut up, water added, and the mass is to be acidulated with acetic acid. It is then to be set aside, and after some time filtered. The fluid is then to be evaporated below the boiling point, to the consistence of a syrup. Next add strong alcohol; break down any lumps that may form; when cold, the solution is to be filtered; evaporate the liquid to the consistence of a thin syrup, this is to be taken up by distilled water; add now acetate of lead, a precipitate falls, filter and wash it. The filtered fluid contains the morphia; the precipitate is composed of meconate of lead.

The fluid part is to be treated with sulphuretted hydrogen, to throw down any lead that may remain in solution. It is then to be filtered while cold, and evaporated sufficiently in a vapour bath. To purify it still further, the fluid is to be precipitated with ammonia; the precipitate having been collected, washed, and drained, on a filter, the precipitate, and portion of filter to which it is attached, are to be boiled in a little pure alcohol. The alcoholic solution which is to be filtered, if necessary, when evaporated, gives a crystalline residue.

Now when nitric acid is added, it turns orange-red; and when suspended in water, becomes blue with per-muriate of iron. (*Christison on Poisons*, page 607.)

To detect the meconic acid, take the precipitate caused by the acetate of lead, suspend it in water, and precipitate the lead by sulphuretted hydrogen. To purify it still more, add fresh acetate of lead; suspend the precipitate in water, and again pass sulphuretted hydrogen through it; by this means the meconic acid is rendered sufficiently free to be tested by its appropriate reagents; concentrate it by evaporation, add per-muriate of iron, which immediately gives a cherry-red color to the solution.

REMARKS.

The action of opium on some persons is very peculiar. A lady I have been in the habit of attending, cannot take the smallest dose, as it brings on violent convulsions, yet bears the acetate of morphia very well. Other persons are in the habit of eating large quantities daily, as it causes a temporary state of excitement. An old woman, aged 67, has taken opium for many years; I have known her take as much as 5 grains of crude opium at once, and repeat the dose four times during the day.

It requires great circumspection and care on the part of the medical jurist (when on post mortem examinations he finds traces of opium) not to pass too hasty a conclusion, which may either endanger the life of a prisoner, or allow the guilty to escape unpunished. For there are many persons who daily take large doses of opium, and if death should occur from any unforeseen accident a short period after a dose of that drug had been taken, his too hasty judgment might be the means of producing great inconvenience, or even fatal consequences.

In such cases where opium is found in the stomach, it is the imperative duty of the medical jurist to use his utmost endeavours to learn the previous habits of the deceased, and not to allow his investigations to cease till all the most important organs of the body have been carefully examined, so that he may be fully assured death could have arisen from no other cause.

SOLANUMS.

They belong to the class, *pentandria.* Order, *monogynia.* Natural order, *solaneæ.* They possess narcotic properties in a slight degree. The principle is found in the leaves and berries. There are several indigenous varieties of this plant—the solanum, daleamum, nigrum, &c.

There are several other plants which possess narcotic properties in a very slight degree, but they are too unimportant to occupy our attention in this place.

NARCOTO-ACRIDS.

In this class, those vegetable poisons are included which have two actions; the one local, producing irritation and inflammation; the remote, acting on the nervous system, and producing narcotism.

This peculiar action seems to depend, in a great measure, upon the dose, as in small quantities they generally produce irritation and inflammation; in large ones, narcotism. It seems that this class is the connecting link between the irritants and narcotics; the morbid appearance generally indicating signs of recent inflammation, while the symptoms during life present those of a narcotic poison.

TREATMENT.

The general plan of treatment is the same as that laid down for narcotics.

ÆTHUSA CYNAPIUM; OR, FOOLS' PARSLEY.

Class, *pentandria*. Order, *digynia*. Natural order, *umbellatæ*. It resembles parsley very much at first sight, but the leaves are of a blackish green; and when rubbed, emit a most nauseous odour, not like the acronatic scent of the parsley. Its active principle resides in an alkaloid base.

SYMPTOMS.

The chief general symptoms are nausea, vomiting, heat in the mouth and throat, great prostration of strength, delirium, convulsion, and coma.

TREATMENT.

Same as for narcotics.

ATROPA BELLADONNA.

Class, *pentandria.* Order, *monogynia.* Natural order, *solaneæ*, *indigenous.* The whole plant contains a peculiar alkaloid base wherein its active properties reside, called atropine.

This poison has a very peculiar effect of dilating the pupil when applied to any part of the body. If taken internally for some time, dimness or tempory loss of vision follows. When taken in poisonous doses, there is great thirst and fever, nausea, vomiting, generally some remains of the poison is brought up, dilatation of the pupil, great insensibility of the eye to external objects, delirium, generally accompanied with uncontrollable fits of laughter or extravagant movements, this is followed by lethargy and a comatose state of the body.

In poisoning with belladonna the affection of the eyes frequently remains some considerable time after the other symptoms have vanished, and these generally do not cease till 24 or 48 hours, or even longer.

TREATMENT.

The treatment must be the same as for opium.

MORBID APPEARANCES.

The blood is generally fluid, and the vessels of the head much gorged.

DATURA STRAMONIUM.

Class, *pentandria*. Order, *monogynia*. Natural order, *solaneæ*. Came first from North America, but now grows wild in the neighbourhood of London. Its peculiar active principle resides in an alkaloid base, extracted from the whole plant, and called daturia.

SYMPTOMS.

It produces in some persons a kind of intoxication, followed by great thirst, delirium, convulsion, paralysis, and coma.

MORBID APPEARANCE.

Congestion of the brain is sometimes found.

DIGITALIS PURPUREA.

Class, *didynamia*. Order, *angiospermio*. Natural order, *scrophularineæ*. Its active principle resides in an alkaloid base, called digitalia, obtained from the leaves. It is one of those medicines that accumulate in the system.

SYMPTOMS.

When taken in an over-dose it produces giddiness, nausea, vomiting, and great restlessness; prostration of strength, with a lowering of the pulse, which sometimes falls from 100 to 40 beats in a minute. Persons who have been in the habit of taking it for some time, have been known to fall down and expire on making some extra exertion.

TREATMENT.

When a person has taken an over-dose, the treatment is the same as for opium; but in prescribing this medicine, the pulse must be narrowly watched, and if no effect has been produced, he must directly discontinue the use of it; give some aperient medicine, and keep the patient quiet; the horizontal position is preferable.

MORBID APPEARANCES.

Blood black, or dark colored, and fluid.

CAMPHOR.

Camphor is obtained from the laurus camphora. Class, *enneandria*. Order, *monogynia*. Natural order, *laurineæ*.

SYMPTOMS.

There are only a few cases on record where it has been taken, and in none where it has proved fatal. There is generally giddiness, confusion of thought, tremors, and delirium.

TREATMENT.

The same as for the other narcotics.

COCCULUS INDICUS.

Class, *deœcia*. Order, *dodecandria*. Natural order, *menespermeæ*. Its active principle is obtained from the fruit, and is called picrotoxa.

SYMPTOMS.

It produces vomiting shortly after being taken, with pains in the stomach; but I believe there is no well authenticated case of poisoning with it.

CONIUM MACULATUM.

Class, *pentandria.* Order, *digynia.* Natural order, *umbellatæ.* Its active principle is called conia, and is obtained from the juice. It is known from the other umbellatæ by having reddish purple spots on its stem.

SYMPTOMS.

Resemble opium.

TREATMENT.

The same as for opium.

CICUTA VIROSA.

The root of the cicuta virosa, or water hemlock, resembles parsnips, and children have occasionally eaten them. It produces severe headache, giddiness, nausea, vomiting, insensibility, convulsions, with tetanic spasms.

TREATMENT.

Same as for opium.

LOLIUM TEMULENTUM, OR DARNEL GRASS.

Class, *triandria*. Order, *digynia*. Natural order, *gramineæ*. This is the only grass that possesses noxious properties. It causes headache, giddiness, nausea, vomiting, with colic pains, somnolency, delirium, spasms, and paralysis.

TREATMENT.

The treatment must be the same as for opium.

NICOTIANA TABACUM.

Class, *pentandria*. Order, *monogynia*. Natural order, *solaneæ*. It is a denizen of the New World, and was first brought to this country by Sir Walter Raleigh, and has since become very common.

SYMPTOMS.

The first symptoms are, excitement, then nausea, headache, giddiness, vomiting, and fainting, pulse very feeble and vascillating; a degree of stupor and insensibility next ensues.

It acts in a similar manner when injected into the rectum, producing great relaxation of the muscular fibre, nausea, vomiting, syncope, convulsions, &c., sometimes accompanied with stertorous breathing.

TREATMENT.

Same as for opium.

SECALE CORNUTUM, OR SPURRED RYE.

Situated on the inside of the glume of some of the grasses, a brownish purple substance is found which is called *ergot* by the French, spur grain by the English. It is thought to be, by some persons, a species of fungus, by others that it is owing to the grain being punctured by a butterfly. It chiefly attacks rye, from whence it derives its name; that which grows in a damp situation, and in a clayey soil, is rendered more liable to be affected with this disease.

SYMPTOMS.

Its action on the animal frame is very peculiar. Giddiness, dilatation of the pupil, dimness of vision, delirium, and coma; sometimes the patient appears as if he were drunk.

When the ergot has been taken for some time (as it occasionally gets mixed and ground up with the flour) it produces two forms of disease, the one convulsive ergotism, the other gangrenous ergotism.

CONVULSIVE ERGOTISM.

It comes on, according to T. A. Srine, with an uneasiness about the feet, shortly followed by cardialgia; the hands and head soon become affected, the fingers are sometimes seized with so strong a contraction, that the most powerful man can scarcely master them, the articulations appearing to be luxated. The patients utter acute cries, and seem to be devoured by a fire which burns their hands and feet. After these pains, the head feels heavy, accompanied with giddiness, the eye-sight becomes much impaired, the intellectual faculties are perverted; mania, melancholy, or coma, takes place, the giddiness increases, and the patient appears intoxicated, opistholonas is present; the mouth is filled with foam almost bloody, or yellow, or green. The tongue is often lacerated by the violence of the convulsions; it swells sometimes to such a degree as to intercept the voice and produce a copious secretion of saliva; out of 500 cases 300 children died, the faces of some of them were covered with an eruption.

GANGRENOUS ERGOTISM.

In this species of disease the extremities become red, and a fœtid greenish matter is discharged; the body becomes more or less discoloured; great debility, the toes and fingers slough off. According to Lang's account, that form of it that appeared in Switzerland in 1709, commenced with general debility, and a sensation as if insects were creeping over the body. After some time the extremities became cold, stiff, and benumbed. This was followed by fever; excruciating pains in the limbs; the fingers, toes, and legs shrivelled up, and fell off at the joints.

In small doses it has the property of acting on the uterus and causing it to contract, and has accordingly been used in midwifery with success.

TREATMENT.

When an over dose has been taken, we must pursue the same plan as that laid down for opium. In treating its convulsive and gangrenous state, it comes under the province of the physician and surgeon.

STRYCHNOS NUX VOMICA.

Class, *pentandria.* Order, *monogynia.* Natural order, *apocyneæ.* The peculiar property of this plant resides in an alkaloid base, called strychnia; there are several plants in this class from which it may be obtained, as the St. Ignatius' bean, the St. Tieuté, or Upas Tieuté.

SYMPTOMS.

When a poisonous dose of strychnia has been taken, violent tetanic spasms seize on all the voluntary muscles, the limbs are powerfully extended, the body generally straight and stiff; respiration is performed with the greatest difficulty, or stopped, the features are violently distorted, pulse imperceptible, and the patient generally sinks during one of these paroxysms.

TREATMENT.

We must empty the stomach of its contents as soon as possible; the stomach pump has been much recommended in this kind of poisoning, as the powdered styrchnia often adheres tenaciously to the coats of the stomach; this viscus must be washed out frequently with warm water. If the stomach pump is not at hand, some emetic must be given, as sulphate of zinc, tartar emetic, or two tea-spoons full of flour of mustard in a tumbler of warm water, drinking plenty of diluents, so that the action of vomiting may be continued. When the spasms are on, large doses of opium and tobacco injections have been recommended.

MORBID APPEARANCES.

In the stomach there are generally some signs of inflammation and softening, engorgement of the vessels of the brain, softening of the substance and cortex of the brain and cerebellum, blood dark coloured and fluid, great rigidity of the body in death.

TESTS.

Strychnia is obtained from the kernel, which is a roundish flattened body, with a slight concavity in the centre, of a light greenish brown, or stone colour, generally about six-eighths of an inch in diameter. Its powder has a greenish cast and is intensely bitter, one grain in 1,600,000 has a sensible bitter taste. Strychnia is united with igasuric acid in the nut. When strong nitric acid is poured on it, it turns red; with tincture of galls, a stone coloured precipitate is thrown down.

NAMES OF SUBSTANCES ACCORDING TO THE NEW PHARMACOPŒIA.

NOMINA PRIORA.	NOMINA NOVA.
Acidum Muriaticum	Acidum Hydrochloricum.
Ammoniæ murias	Ammoniæ Hydrochloras.
——— subcarbonas	——— sesquicarbonas
Antimonii sulphuretum	Antimonii sesquisulphuretum.
——— sulphuretum præcipitatum	——— oxysulphuretum.
——— tartarizatum	——— potassio-tartras.
Arsenicum album	Acidum arseniosum.
Bismuthi subnitras	Bismuthi trisnitras.
Calcis murias	Calcii chloridum.
Ferri subcarbonas	Ferri sesquioxidum.
Hydragyri oxidum cinereum	Hydrargyri oxidum.
——— oxydum rubrum	——— binoxidum.
——— oxymurias	——— bichloridum.
——— submurias	——— chloridum.
——— sulphuretum nigrum	——— sulphuretum cum sulphure.
——— rubrum	——— bisulphuretum.
——— Præcipitatum album	——— ammonio-chloridum.
Sodæ carbonas	Sodæ sesqui-carbonas.
—— murias	Sodii chloridum.
—— subcarbonas	Sodæ carbonas.

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